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RUST

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SKINNER LANDFILL
West Chester, Butler County, Ohio

Remedial Design

**Final Design (100%)
Phase I Report**

Volume IV of IV

May 20, 1996

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SUPPORT PLAN A

**SKINNER LANDFILL SUPERFUND SITE
QUALITY ASSURANCE PROJECT PLAN
WEST CHESTER, BUTLER COUNTY, OHIO**

**Rust Environment & Infrastructure of Ohio Inc.
PROJECT NO. 72680**

May 20, 1996

LIST OF ACRONYMS

AMP	Air Monitoring Plan
AOC	Administrative Order on Consent
BCDES	Butler County Department of Environmental Services
BOD	Biochemical Oxygen Demand
CLP	Contract Laboratory Program
COD	Chemical Oxygen Demand
Conrail	Consolidated Railroad Corporation
CQAP	Construction Quality Assurance Plan
CRL	Central Regional Laboratory
DNAPLs	Dense Non-Aqueous Phase Liquids
DQOs	Data Quality Objectives
FS	Feasibility Study
FSP	Field Sampling Plan
ft	Feet
HASP	Health and Safety Plan
ID	Inner Diameter
LTPP	Long-Term Performance Plan
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSL	Mean Sea Level
NCP	National Contingency Plan
NEI	Nytest Environmental, Inc.
NITS	National Institute of Testing and Standards
OEPA	Ohio Environmental Protection Agency
PCBs	Polychlorinated Biphenyls
PAHs	Polynuclear Aromatic Hydrocarbons
PPE	Personal Protective Equipment
PRP	Potentially Responsible Party
QA	Quality Assurance
QAPP	Quality Assurance Project Plan (Laboratory)
QAPjP	Quality Assurance Project Plan
QC	Quality Control
RA	Remedial Action
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
Rust	Rust Environment & Infrastructure of Ohio Inc.
SU	Standard Units
SOP	Standard Operating Procedure
SOW	Statement of Work

LIST OF ACRONYMS - CONT

SVE	Soil Vapor Extraction
SVOCs	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TCL	Target Compound List
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
U.S. EPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

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1.0 PROJECT DESCRIPTION

The United States Environmental Protection Agency (U.S. EPA) requires that all environmental monitoring and measurement efforts mandated or supported by U.S. EPA participate in a centrally managed quality assurance (QA) program.

Any party generating data under this program has the responsibility to implement minimum procedures to assure that the precision, accuracy, completeness and representativeness of its data are known and documented. To ensure the responsibility is met uniformly, each party must prepare a written QA Project Plan (QAPjP) covering each project it is to perform.

This QAPjP presents the organization, objectives, functional activities and specific QA and the quality control (QC) activities associated with implementing the Remedial Design (RD) at the Skinner Landfill Site. This QAPjP also describes the specific protocols which will be followed for sampling, sample handling and storage, chain-of-custody, and field and laboratory analysis.

All QA/QC procedures will be in accordance with applicable professional technical standards, U.S. EPA requirements, government regulation and guidelines, and specific project goals and requirements. The laboratory to be used during this project is Nytest Environmental, Inc. (NEI). NEI has prepared a Comprehensive Quality Assurance Project Plan (QAPP) dated October, 1995 which documents how compliance with these requirements will be achieved. In the event another laboratory is selected to replace NEI during the RA, applicable sections of the replacement laboratory's QAPP will be attached to this RD QAPjP, pending approval by the U.S. EPA. A laboratory has not yet been selected for conducting the analysis on the effluent samples. When the effluent laboratory has been selected, applicable sections of the laboratory's QAPP will be attached to this RD QAPjP, pending approval by the U.S. EPA.

This RD QAPjP was prepared by Rust Environment & Infrastructure of Ohio Inc. (Rust) on behalf of the Skinner Landfill Potentially Responsible Party (PRP) Group in accordance with all U.S. EPA QAPjP guidance documents including the Contract Laboratory Program (CLP) guidelines, Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005/80), and the U.S. EPA Region V Model QAPjP (1991) and Model Mini-QAPjP (1993).

1.1 Site Location and Description

The Skinner Landfill is located approximately 15 miles north of Cincinnati, Ohio near West Chester, Butler County, Ohio in Township 3, Section 22, Range 2. The site is located along Cincinnati-Dayton Road as shown in Figure 1. The site is bordered on the south by the East Fork of Mill Creek, on the north by wooded land, on the east by a Consolidated Railroad Corporation (Conrail) railroad right-of-way, and on the west by Skinner Creek.

The site is located in a highly dissected area that slopes from a till-mantled bedrock upland to a broad, flat-bottomed valley that is occupied by the main branch of Mill Creek. Elevations on the site range from a high of nearly 800 feet above mean sea level (MSL) in the northeast, to a low of 645 feet above MSL near the confluence of Skinner Creek and East Fork of Mill Creek. Both Skinner Creek and the East Fork of Mill Creek are small, shallow streams. Both of these streams flow to the southwest from the site toward the main branch of Mill Creek. A third on-site stream, Dump Creek, borders the former landfill on the east. Dump Creek is intermittent and flows south into the East Fork of Mill Creek. Three shallow ponds are also located on the site.

In general, the site is underlain by relatively thin glacial drift over interbedded shales and limestones of Ordovician age. The composition of the glacial drift ranges from intermixed silt, sand and gravel, to silty sandy clays; and its thickness ranges from zero to over 40 ft at the site. The sand and gravel deposits comprise the hills and ridges and are encountered near the surface of the central portion of the site. The silts and clays usually occur as lenses in the sands and gravel or directly overlie bedrock.

1.2 Site History and Background

The property was originally developed as a sand and gravel mining operation, and was subsequently used as a landfill from 1934 to 1990. According to U.S. EPA studies, materials deposited at the site include demolition debris, household refuse and a wide variety of chemical wastes. The waste disposal areas include a now buried waste lagoon near the center of the site and a landfill. According to U.S. EPA studies, the buried lagoon was used for the disposal of paint wastes, ink wastes, creosote, pesticides, and other chemical wastes. The landfill area, located north and northeast of the buried lagoon, received predominantly demolition and landscaping debris.

In 1976, the Ohio EPA (OEPA) initiated an investigation of the site in response to reports of a black oily liquid that was observed during a fire call to the site. Before the OEPA could complete the investigation, the landfill owners, the Skinners, covered the lagoon with a layer of demolition debris. Mr. Skinner further dissuaded the OEPA from accessing the site by claiming that nerve gas, mustard gas, and explosives were buried in the landfill. The OEPA requested the assistance of the U.S. Army after obtaining this information. Mr. Skinner later retracted his statements concerning buried ordnance, and an U.S. Army records review performed in 1992 did not reveal any evidence of munitions disposal at the site.

In 1982, the site was placed on the National Priority List by the U.S. EPA based on information obtained during a limited investigation of the site. The investigation indicated groundwater contamination had occurred as a result of the buried wastes. In 1986, a Phase I Remedial Investigation was conducted that included sampling of groundwater, surface water, and soil, as well as a biological survey of the East Fork of Mill Creek and Skinner Creek. A Phase II Remedial Investigation was conducted from 1989 to 1991 and involved further investigation of groundwater,

surface water, soils and sediments. A Baseline Risk Assessment and Feasibility Study (FS) were completed in 1992.

The Phase II Remedial Investigation revealed that the most contaminated media at the site is the soil from the buried waste lagoon. Lower levels of contamination were also found in soils on other portions of the site and in the groundwater, and very low levels were found in the sediments of Mill Creek, Skinner Creek, the Duck Pond and the Diving Pond. Migration of the landfill constituents has been limited, and the Phase II Remedial Investigation concluded that there had been no off-site migration of landfill constituents via groundwater flow.

The Record of Decision (ROD) was developed based on the Phase I and II Remedial Investigation findings and was signed on June 4, 1993. In the ROD, U.S. EPA selected a remedy for the site consisting of multi-media capping of the landfill and the buried waste lagoon, and interception and treatment of the contaminated groundwater. The ROD also required an investigation to determine the feasibility for soil vapor extraction (SVE) in the granular soil adjacent to the buried lagoon.

A RD Pre-design field investigation was performed in 1994 and 1995 to collect data required to assess the feasibility of the SVE and to design the multi-media cap and the groundwater extraction/treatment systems. Based on the results of the pre-design field investigation, necessary data was collected to design the U.S. EPA selected remedies. The following results were developed based on the pre-design investigation:

- o Groundwater analysis conducted during previous investigations and the Pre-design RD field investigation indicated groundwater has been impacted at the Skinner Landfill Site and the current groundwater conditions are similar to those used to develop the ROD;
- o Trigger levels used in the Administrative Order to define groundwater contamination were modified based on the methods described in the Statement of Work (SOW);
- o A combination of collection trenches and cut-off wall were proposed as the downgradient groundwater control system;
- o Effluent discharge standards for the treated groundwater were proposed;
- o The extent of contaminated soil from three isolated areas and the Northeastern Corner was defined. Contaminated soil was only identified at two of the isolated areas (at BP01/BP02 and around GW-38) and was not identified in the Northeastern Corner;
- o The limits of landfill waste were defined; and
- o The SVE system for the removal of organic vapors within the permeable materials adjacent to portions of the buried waste lagoon was determined not to be feasible.

1.3 Project Objectives and Scope

This QAPjP is part of the RD for the Skinner Landfill. The RD QAPjP has been prepared pursuant to the requirements of the SOW of the Administrative Order on Consent (AOC) between the U.S. EPA and the Skinner Landfill PRP Group dated June 4, 1993. The QAPjP is an integral part of the RD and defines the site-specific QA methods and controls that will be used to collect and analyze samples during the implementation of the RA. The RD QAPjP is designed to ensure that the quality, precision, accuracy, and completeness of the data generated meets the established data quality objectives (DQOs).

The selected RA components at the Skinner Landfill include the following:

- o Institutional Controls;
- o Engineered Landfill Cap (including excavation and consolidation of contaminated soils underneath the cap);
- o Groundwater Interception and Treatment Systems;
- o Air Compliance Monitoring (during construction of the Landfill Cap and Groundwater Interception and Treatment Systems);
- o Groundwater Compliance Monitoring; and
- o Surface Water Monitoring.

Sampling and chemical analysis of soils, groundwater, effluent and surface water will occur as part of this project during the implementation of the RA. Testing of samples related to the design and construction of the site remedy will also be conducted. A description of these and other field activities are included in the RD Field Sampling Plan (FSP) and in the Long-Term Performance Plan (LTPP), RD Air Monitoring Plan (AMP), RD Health and Safety Plan (HASP), RD Construction Quality Assurance Plan (CQAP), and in the applicable RD sections. An overview of the RA sampling and chemical analysis programs is presented in Table 1.

1.4 Sample Network Design and Rationale

The RD FSP includes site-specific sampling plans, sampling procedures and methodologies, site maps and details of the level of effort to be used during the implementation of the RA at the Skinner Landfill. A description of the sampling activities is summarized below. Locations of all field sampling activities are shown in Drawings 1, 2 and 3 of the FSP.

1.4.1 Contaminated Soil Design Investigation

Soil contamination at the Skinner Landfill (outside the limits of the landfill cap) will be excavated and incorporated under the multi-media cap. The aerial extent of this contaminated soil was defined in the RD Pre-design Report Contaminated Soils Design Investigation, June 1, 1995 based on data collected during the Phase II Remedial Investigation and the RD Pre-design Investigation. Per the RD Pre-design Report, soil contamination above the SOW trigger levels were identified at two areas (BP01/BP02 and around Well GW-38).

Buried Pit Area (BP01/BP02) Polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and lead have been identified in the vicinity of BP01/BP02. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene and lead were identified at concentrations exceeding the U.S. EPA specified remedial trigger levels (see Table 3).

The areal extent of contamination is defined in Figure 2, with contamination estimated to extend to a depth of 7.5 feet below ground surface. Excavation of the contaminated soil will be conducted during the RA until clean soil (below the remedial trigger levels) is confirmed through the chemical analysis of the underlying unexcavated material. Each RA soil sample will be collected for analysis of the parameters listed in Table 3 of this RD QAPjP.

Well GW-38 Area PAHs have been identified in the vicinity of GW-38 during previous field investigations. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and chrysene were identified at concentrations exceeding the remedial trigger levels (see Table 3).

The areal extent of contamination around GW-38 is defined in Figure 3 with contamination estimated to extend to a depth of 7.5 feet below ground surface. Excavation of the contaminated soil will be conducted during the RA until clean soil (below the remedial trigger levels) is confirmed through the chemical analysis of the underlying unexcavated material. Each RA soil sample will be collected for analysis of the parameters listed in Table 3 of this RD QAPjP.

1.4.2 RA Surface Water Monitoring

During the RA, contaminated soil excavation activities of the RA at BP01/BP02 and around GW-38 may have an impact on the surface water quality of the East Fork of Mill Creek and Skinner Creek. To monitor the potential impacts, the East Fork of Mill Creek and Skinner Creek will be evaluated during the RA by collecting/analyzing surface water samples from five sample locations (see FSP Drawing 3 for location of SW-50, SW-51, SW-52, SW-53 and SW-54) and comparing the RA results to the data collected during the baseline surface water study conducted during the RD Pre-design Investigation. Each surface water sample will be collected and analyzed for the parameters listed in Tables 4, 5, 6, 7, and 8 of this QAPjP. Surface water samples will be collected quarterly until the completion of the excavation activities.

Surface water run-off associated with the installation of the groundwater interception/treatment system and the landfill cap may have an impact on the surface water quality of the East Fork of Mill Creek. The potential impacts to the East Fork of Mill Creek will be evaluated during the RA by collecting/analyzing surface water samples from three sample locations (see FSP Drawing 3 for locations of SWD-1, SWD-2 and SWD-3) and comparing the RA results to the data collected during the baseline surface water study conducted during the RD Pre-design Investigation. Each surface water run-off sample will be collected and analyzed for the parameters listed in Tables 4, 5, 6, 7, and 8 of this QAPjP. Run-off samples will be collected monthly until the completion of the RA construction activities (but only after a rain event).

Finally, the long-term effectiveness of the U.S. EPA-approved remedy in protecting the surface water quality of the East Fork of Mill Creek will be evaluated. To monitor the water quality, surface water samples will be collected and analyzed from four sample locations (see LTPP Drawing 2 for locations of SW-50, SW-51, SW-52 and SW-53) and the results compared to the data collected during the baseline surface water study conducted during the RD Pre-design Investigation. Each surface water sample will be collected and analyzed for the parameters listed in Tables 4, 5, 7, and 8 of this QAPjP.

In the event the quarterly surface water sampling coincides with the surface water sampling associated with the contaminated soil excavation activities, sample redundancy will be eliminated and only one sample will be collected from each of the applicable sample locations.

1.4.3 RA Groundwater Monitoring

Per Section II of the SOW, a downgradient groundwater control system is required at the Skinner Landfill Site. This control system is designed to intercept and capture groundwater migrating from the landfill to the East Fork of Mill Creek. The general requirements and site location of the Interception system are defined in Section 2.0 of the Design Report.

The purpose of the groundwater monitoring program found in the FSP and LTPP is to evaluate the long-term performance of the Groundwater Interception System (interception trench and cut-off wall), the cap and the possible presence and/or movement of dense non-aqueous phase liquids (DNAPLs) in the vicinity of the buried waste lagoon.

The groundwater monitoring program will include: 1) installing groundwater monitoring wells downgradient of the buried waste lagoon and downgradient of the cut-off wall, 2) installing piezometers upgradient of the groundwater interception system, 3) measuring groundwater levels upgradient/within the interception trench, groundwater levels downgradient of the cut-off wall, and surface water levels in the East Fork of Mill Creek, 4) monitoring for DNAPLs downgradient of the waste lagoon and 5) collecting and analyzing groundwater samples from monitoring wells downgradient of the groundwater interception system.

1.4.4 RA Interception and Treatment Systems Shut-down

As stated in the SOW, a petition may be filed to terminate operation of the groundwater interception and treatment systems when groundwater in the interception trench and groundwater downgradient of the cut-off wall contain concentrations of contaminants less than those listed in Table 2 of this QAPjP. To meet this condition, groundwater samples from the interception system may be periodically collected and analyzed for the parameters listed in Table 2. The results of these analyses will be compared to the results from the quarterly groundwater performance monitoring. In the event groundwater within the trench and downgradient of the cut-off wall are less than the Table 2 trigger levels (after 4 quarterly sampling events), a petition may be filed with the U.S. EPA to cease operation of the groundwater interception and treatment systems.

1.4.5 Effluent Monitoring

A request has been submitted for authorization to the Butler County Department of Environmental Services (BCDES) to discharge the collected groundwater to a sanitary sewer located on the site. This application is pending. It is anticipated that BCDES will include a requirement to periodically sample the discharge and analyze for certain constituents. However, the exact list of parameters to be analyzed and the frequency of sample collection has not yet been established by BCDES. When the parameters are established, they will be incorporated into this QAPjP as Table 10. The appropriate analytical methods will be identified in Appendix V. The authorization to discharge itself will be added as Appendix III.

1.4.6 Air Monitoring

Personnel and perimeter air monitoring will be conducted during the excavation of the contaminated soils, the construction of the RA cap, and the installation of the interception and treatment systems. The intent of the air monitoring is to determine the effectiveness of on-site controls to prevent airborne contaminant migration and to determine the level of Personal Protective Equipment (PPE) to be worn by the RA personnel. Procedures for this monitoring are found in the RD AMP.

1.5 Data Quality Objectives

The DQOs for field measurements (temperature, pH, conductivity, and dissolved oxygen) will be Level 1, a screening level appropriate for real-time field measurements. The DQOs for the non-CLP parameters (see Table 8) will be Level 3, appropriate for non-CLP analysis. The DQOs for the CLP data will be Level 4, a conformational level using the full CLP protocols.

2.0 PROJECT ORGANIZATION

The project organization for RA activities is presented below. A project organization chart for the RA at the Skinner Landfill Site is presented in Figure 4.

2.1 Agency Participants

U.S. EPA Remedial Project Manager - Jamey Bell has responsibility for overseeing implementation of the RA for U.S. EPA. He is the primary point of contact and communication for the agency.

U.S. EPA Region V QA Officer - The U.S. EPA QA Officer has responsibility for reviewing and approving this RD QAPjP, and is available to the U.S. EPA Remedial Project Manager (RPM) as needed for consultation on QA issues.

Ohio EPA Site Coordinator - Greg Youngstrom has responsibility for representing the interests of OEPA with respect to the RA activities at the Skinner Landfill Site. He is available to the U.S. EPA RPM as needed for consultation on technical and policy issues.

2.2 Implementor Participants

Implementor Technical Committee Chairman - The Group implementing the remedy will designate an RA Project Coordinator. As such, he has responsibility for overseeing implementation of the AOC for the Group. He will be the primary point of contact for the Group for approving or modifying the scope of work.

Implementor's QA Officer - The Implementor will designate a QA Officer. He will be responsible for overseeing audits of field and laboratory work and for performing independent validation of the data received from the analytical laboratories.

Implementor's Project Administrator - The Implementor will designate a Project Administrator for the Group. He will be responsible for implementation of the approved scopes of work and may communicate directly with the U.S. EPA RPM as needed for this purpose.

Implementor's Technical Project Manager - The Implementor will designate a Technical Project Manager for the Group. He will be responsible for overseeing the day-to-day sampling activities for the RA at the Skinner Landfill Site.

Field Team Leader - The Implementor will designate a Field Team Leader for the Group. He will be responsible for implementing the day-to-day sampling activities for the RA at the Skinner Landfill.

Sampling Team - The sampling team to be utilized to implement the RA field sampling activities will be designated by the Implementor. The technical team will gather and analyze data, and prepare various reports. All of the designated technical staff members will be experienced professionals who possess the degree of specialization and technical competence required to effectively and efficiently perform the required work.

2.3 RA Construction Company

The selected RA construction company will be responsible for implementing the RD. The RA construction company will also be responsible for coordinating its construction activities with the sampling activities.

2.4 Laboratory Staff

Laboratory analytical services could be performed by NEI of Port Washington, New York, the present lab contractor. Descriptions of the organization, responsibilities, capabilities, and individual duties of the personnel at the laboratory are presented in Section 4 of the NEI Comprehensive QAPP (see Appendix I). Lori Beyer would serve as NEI's Project Manager for this work and would be the prime point of contact at the laboratory.

A laboratory has not yet been selected for conducting the analysis on the effluent samples. When the effluent laboratory has been selected, applicable sections of the laboratory's QAPP will be attached to this RD QAPjP, pending approval by the U.S. EPA.

2.5 Specific Responsibilities

Day-to-day soil, groundwater, air, effluent and surface water sampling activities to be implemented during the RA could be performed and directed by experienced staff.

Evidence audits of QAPjP field records could be performed by the Implementor's QA Officer and/or the Technical Project Manager.

External field audits of the Laboratory QAPPs will be performed by the Implementor's QA Officer and/or Technical Project Manager for the Group implementing the remedy, and external laboratory audits may be performed by the Group's QA Officer and/or Project Coordinator.

External performance and system audits of the Laboratory's may be performed by Region V Central Regional Laboratory personnel.

3.0 QUALITY ASSURANCE OBJECTIVES FOR ANALYTICAL DATA

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide results which are legally defensible in a court of law. Specific procedures for sampling, chain-of-custody, laboratory analysis, reporting of data, internal QC, audits, preventive maintenance of field equipment and corrective action are described in other sections of the QAPjP. The purpose of this section is to address the specific objectives for accuracy, precision, completeness, representativeness and comparability.

3.1 Level of Quality Control Effort

Field blank, trip blank, duplicate, matrix spike and matrix spike duplicate samples will be analyzed to assess the quality of the data resulting from the field sampling program. Field blanks will consist of deionized water placed in sample containers at the site using the same (decontaminated) equipment that will be used to collect the samples. Field blanks are used to check for contamination which may have been introduced as a result of the sampling procedures and/or from ambient field conditions. Field blanks will be collected at the rate of at least one per 10 investigative samples (i.e., 10%).

Trip blanks will consist of deionized water placed in sample containers in the laboratory. These samples will accompany the other (empty) sample containers to the site, be kept with them in the field and accompany the field samples back to the laboratory. Trip blanks are used to assess the potential for volatile organic compound (VOC) contamination of samples due to contaminant migration during shipment and storage. One trip blank will accompany each shipment of VOC samples.

Field duplicate samples will consist of sequentially collected samples obtained from the same sampling point. They are analyzed to check for sampling and analytical reproducibility. Duplicate samples will be collected at the rate of one per 10 investigative samples (i.e., 10%).

Matrix spike samples (which are prepared in the laboratory from extra investigative sample volume collected in the field) provide information about the effect of the sample matrix on the preparation and analytical measurement methodology. The extra volumes required are triple the normal volume for VOC analysis and double the normal volume for other organic analyses. These extra volumes are in addition to the normal volume requirements for the investigative sample. All matrix spikes for organic analyses are performed in duplicate and are hereafter referred to as MS/MSD samples. MS/MSD samples will be collected (for organic analysis) at the rate of one per 20 investigative samples (i.e., 5%). A matrix spike and laboratory duplicate for inorganics will be analyzed at the rate of one each per 20 investigative samples (i.e., 5%). These analyses must be performed on an aliquot from the original investigative sample container; no extra sample volume is required (provided a full sample is collected).

The level of QC effort for chemical measurements made in the field is specified in the SOPs for field measurement of temperature, pH, conductivity, and dissolved oxygen. The SOP's are contained in Appendix II of this QAPjP.

The number of investigative and QA/QC samples to be collected during the implementation of the RA is shown in Table 1. The specific parameter lists for each sample are described in Tables 2 to 8. Samples collected during this project will be sent to NEI for the following analyses: 1) CLP SOW OLM01.8 for the analysis of organics, 2) CLP SOW ILM03.0 for the analysis of the inorganics, and 3) the methods listed in Table 8 for the additional surface water parameters. The methods listed in 40CFR136 will be used by the laboratory to be selected to conduct the effluent analyses when BCDES issues discharge criteria. The level of laboratory QC effort to be used for this project will be consistent with the requirements of the CLP SOWs and the laboratory's SOP/methods for parameters identified in the Tables 4 to 8.

3.2 Accuracy, Precision, and Sensitivity of Analysis

The fundamental QA objective with respect to accuracy, precision, and sensitivity of laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols.

The accuracy and precision requirements for analytical work for this project will be those specified in the CLP SOWs (i.e., OLM01.8 for organics and ILM03.0 for inorganics) and the methods specified in Appendices IV, and V for the analysis of the parameter listed in the Tables. The accuracy, precision and sensitivity segments for chemical measurements made in the field are specified in the SOP's contained in Appendix II.

3.3 Completeness, Representativeness, and Comparability

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. It is expected that the laboratories will provide data meeting QC acceptance criteria for 95 percent or more for all samples tested using CLP SOWs (i.e., OLM01.8 for organics and ILM03.0 for inorganics), the methods listed in Table 8 for the additional surface water parameters, parameters, and Table 10 for the effluent parameters (when issued by BCDES). The calculation of completeness is described in Section 12.0 below.

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter which is dependent upon the proper design of the sampling program and proper laboratory protocols. The sampling network was selected to provide data representative of site conditions based on previous studies conducted at the site. Representativeness will be satisfied by ensuring proper sampling techniques are used,

proper analytical procedures are followed, and holding times of samples are not exceeded. Representativeness will also be assessed by the analysis of field duplicate samples.

Comparability expresses the confidence with which one data set can be compared with another. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. Analytical results are comparable to results of other laboratories with the use of the following procedures/programs: instrument standards traceable to National Institute of Testing and Standards (NITS) or U.S. EPA sources; the use of standard methodology; reporting results from similar matrices in consistent units; applying appropriate levels of quality control within the context of the laboratories quality assurance program; and participation in inter-laboratory studies to document laboratories performance. By using traceable standards and standard methods, the analytical results can be compared to other laboratories operating similarly. The QA Program documents internal performance, and the inter-laboratory studies document performance compared to other laboratories. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance. The procedures used to obtain the planned analytical data, as documented in this QAPjP, are expected to provide comparable data.

4.0 SAMPLING PROCEDURES

Detailed descriptions of the sampling procedures to be used during the RA are described in the RD FSP, RD AMP, RD HASP, RD CQAP, and RD LTPP.

5.0 SAMPLE CUSTODY

It is U.S. EPA and Region V policy to follow the U.S. EPA Region V sample custody, or chain of custody protocols as described in "NEIC Policies and Procedures", EPA-330/9-78DDI-R, revised June 1985. The custody requirements are in three parts: sample collection, laboratory analysis, and final evidence files. Final evidence files, including all originals of laboratory reports and files, are maintained under document control in a secure area. A sample or evidence file is under document control if it:

- o is in the possession of the Implementor;
- o is in the view of a member of the Implementor after being in that member's possession;
- o is in the Implementor's possession and is placed in a secure location; or
- o is in a designated secure area.

5.1 Field Custody Procedures

The procedures for sample documentation, labeling, packaging and shipment summarized below will ensure that the samples arrive at the laboratory with the chain-of-custody intact. The Implementor's QA Officer will review all field custody documentation to assess whether appropriate procedures were followed during field work and include the findings of this assessment in the QA Reports (see Section 14.0).

Documentation - The field activities associated with the contaminated soil excavation program, the groundwater monitoring program, the surface water monitoring program, the air monitoring program, and the CQA program will be documented in field logbooks. Information to be recorded in the logbooks includes basic site conditions, sequence and duration of events, data related to well installation, groundwater sampling and field measurements. Logbook entries will be described in as much detail as possible so that persons going to the site could re-construct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in a centralized secured location in the office when not in use. Each logbook will be identified with a project-specific control number. The title page of each logbook will contain the following:

- o Name of person to whom it is assigned;
- o Logbook number;
- o Project name;
- o Project start date; and
- o Project end date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, level of personal protection being used and the signature of the person making the entry will be entered. The names of visitors to the site and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. All entries will be made in ink and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark, initialed and dated by the person making the entry. All equipment used to make measurements will be identified. A separate logbook will be dedicated specifically for recording instrument calibration and calibration check data.

Samples will be collected following the sampling procedures documented in the RD FSP, RD AMP, RD HASP, RD CQAP and the RD LTPP. The equipment used to collect samples will be noted, along with the time of sampling, sample description, sample volume, and number of containers. Sample identification numbers will be assigned prior to sample collection. Field duplicate samples, which will receive an entirely separate sample identification number, will be noted under sample description.

Labeling -- All bottles will be identified with self-adhesive labels. The labels will show the project name, sample number, sample location, time and date of collection, collector initials and intended analysis. Sample labels will be completed in waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample label because a labeling pen would not function in freezing weather.

Packaging and Shipment -- The sampling will be performed by personnel who will ship the samples directly to the laboratories within 24 hours of collecting the sample. The Field Team Leader will be personally responsible for the care and custody of the samples until they are shipped to the laboratories.

The samples will be packaged for shipment by placing each container in a separate zip-lock storage bag. The bags will then be placed in a cooler with sufficient packing material to adequately protect the containers from breakage, and with sufficient ice or other coolant materials to maintain the temperatures required for proper preservation of the samples.

Separate chain-of-custody forms will be completed for each cooler of samples. Properly completed chain-of-custody forms will show sample number, location, number and kind of containers, and intended analysis, along with the project name and signatures of the samplers. Each cooler will be closed and secured with strapping tape, and custody seals will be placed across the right-front and left-back of the cooler lid. When transferring the possession of samples, the individuals relinquishing and receiving the samples will sign, date and note the time on the chain-of-custody form.

5.2 Laboratory Custody Procedures

Laboratory custody procedures are described in Section 10.0 of NEI's QAPP which is attached in Appendix I. Laboratory custody procedures will be described in the effluent laboratory's QAPP (after it has been selected) and pending approval by the U.S. EPA.

5.3 Final Evidence Files

Custody of the Implementor's final evidence files will be maintained by the Implementor's Technical Project Manager. The files which will include field logbooks and original laboratory reports will be kept in a secured, limited access area.

6.0 CALIBRATION PROCEDURES

This section describes procedures for maintaining the accuracy of all the instruments and measuring equipment which are used for conducting field tests and laboratory analyses. These instruments and equipment will be calibrated prior to each use or on a scheduled, periodic basis.

6.1 Field Instruments

Calibration procedures for field instruments are specified in the field measurement SOPs contained in Appendix II of this QAPjP.

6.2 Laboratory Instruments

Calibration procedures for laboratory instruments will be those specified in the CLP SOWs being used for this project (i.e., OLM01.8 for organics and ILM03.0 for inorganics) and the laboratory SOPs (attached in Appendices IV, V, and VI) being used to analyze the parameters listed in the Tables.

7.0 ANALYTICAL PROCEDURES

7.1 Field Measurements

Reportable measurements of temperature, pH, conductivity, and dissolved oxygen will be performed in the field immediately upon sample collection. The analytical procedures for these field measurements are specified in the field measurement SOPs contained in Appendix II of this QAPjP. Field screening will be made in accordance with proper operating procedures as described in the RD FSP, RD AMP, RD HASP, RD CQAP, and RD LTPP.

7.2 Laboratory Analysis

The analytical procedures for laboratory testing for organics and inorganics will be CLP SOW (OLM01.8 for organics and CLP SOW ILM03.0 for inorganics) and the laboratory SOPs (attached in Appendices IV, V and VI) being used to analyze the parameters listed in the Tables.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

8.1 Field Data

Raw data from field measurements and sample collection activities will be appropriately recorded in the field logbooks. These data will be summarized in tabular form for attachment to the technical memoranda and project reports. Any further reduction of the data for evaluation purposes in the reports will be documented therein.

8.2 Laboratory Data

NEI will perform in-house data reduction and validation in accordance with Section 23.0 (see Appendix I) of their written QAPP, the CLP SOWs being used for this project (i.e., OLM01.8 for organics and ILM03.0 for inorganics) and for the methods listed in Table 8 for the additional surface water parameters. Data reporting by NEI to the Implementor's QA Officer will also conform to the requirements of these SOWs and methods. A laboratory will be selected to analyze the effluent samples and this laboratory will perform in-house data reduction in accordance with their written QAPP for the effluent parameters listed in Table 10 (when they are identified by BCDES).

Analytical data received from the laboratories will be validated by the Implementor's QA officer in accordance with the following U.S. EPA guidance documents:

- o USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, February 1994.
- o USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994.

The Implementor's QA Officer will identify any out-of-control data points and data omissions and interact with the laboratory to correct data deficiencies. Decisions to repeat sample collection and/or analyses may be made by the Implementor's Technical Committee Chairman in conjunction with U.S. EPA's RPM based on the extent of the deficiencies and their importance in the overall context of the project. The results of all sampling and analysis will be reported to U.S. EPA within 60 days of sample collection.

9.0 INTERNAL QUALITY CONTROL CHECK

9.1 Field QC Checks

QC checks on potential impacts to precision and accuracy from sample collection will be assessed through collection and analysis of field duplicates and field blanks in accordance with the applicable procedures described above in Section 3.0.

QC checks for field measurement of temperature, pH, conductivity, and dissolved oxygen are limited to the following: (1) Checking the reproducibility of the measurement by obtaining multiple readings on a single sample/standard or location, and (2) by calibration of the instrument at the beginning of the day, at noon, and at the conclusion of the day's sampling or measurement efforts (or as needed based on site-specific requirements).

9.2 Laboratory Analysis

Two mechanisms will be used by the laboratories to ensure the reporting of analytical data of known and documented usable quality: 1) A formal written QAPP and 2) specific QC checks in accordance with that plan, and the applicable CLP SOWs and methods being used for this project (i.e., OLM01.8 for organics and ILM03.0 for inorganics, and those listed in Table 8 for the additional surface water parameters, 40CFR136 for the Table 10 effluent parameters (when established by BCDES).

Laboratory QAPP

NEI maintains a QAPP and QA program, the stated objective of which is to provide legally and scientifically valid laboratory services. The program directs organizational adherence to a system of mandatory operating practices and procedures which ensure that all generated laboratory data are scientifically correct, legally defensible, and fulfilling of applicable regulatory requirements.

Once the effluent laboratory has been selected, its QAPP and QA program will be attached to this QAPjP, pending U.S. EPA approval.

QC Checks

The specific internal QC checks to be used by the laboratories include those specified in the CLP SOWs and in Appendices IV, V, and VI for the methods being used for this project (i.e., OLM01.8 for organics and ILM03.0 for inorganics, the methods listed in Table 8 for the additional surface water parameters, and 40CFR136 for the Table 10 effluent parameters when established by BCDES).

10.0 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits of both field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the QAPjP. The audits of field and laboratory activities include two separate independent parts: Internal and External audits.

10.1 Field Audits

Internal audits of field activities (sampling and measurements) will be conducted by the Implementor's QA Officer. The audits will include examination of field sampling records, field instrument operating records, sample collection, handling and packaging in compliance with the established procedures, maintenance of QA procedures, chain-of-custody, etc. These audits will occur at the onset of the project to verify that all established procedures are followed. Follow-up audits will be conducted to correct deficiencies and to verify that QA procedures are maintained

throughout the RA activities. The audits will involve review of field measurement records, instrumentation calibration records and sample documentation.

External audits may be conducted by U.S. EPA Region V personnel at the discretion of the U.S. EPA RPM.

10.2 Laboratory Audits

Internal performance and system audits of the laboratories may be conducted by the Implementor's QA Officer. The systems audits, which would be done on an annual basis, would include an examination of laboratory documentation on sample receiving, sample log-in, sample storage, chain-of-custody procedures, sample preparation and analysis, instrument operating records, etc.

The performance audits may be conducted during this project. Blind QC samples may be prepared and submitted along with project samples to the laboratories for analysis throughout the project. The Implementor's QA Officer will evaluate the analytical results of these blind performance samples to ensure the laboratories maintains good performance.

External performance and system audits of the laboratories for approval/disapproval of their performance in the project may be conducted by the U.S. EPA Region V Central Regional Laboratory.

11.0 PREVENTATIVE MAINTENANCE

11.1 Field Instruments

The field instruments for this project include thermometers, pH meters, conductivity meters, and dissolved oxygen meters. The specific preventive maintenance procedures to be followed for field instruments are those recommended by the respective manufacturers. The preventive maintenance schedule is included in Table 9. Internal preventative checks will be conducted at least monthly and will include reviewing the calibration and maintenance logs for each piece of equipment. In addition, the equipment will be turned on and tested to determine that it is functioning properly. The manufacturers will be contacted at least once a year to test the functionality of each piece of equipment.

Field instruments will be checked and calibrated before they are shipped or carried to the field. These instruments will be checked and calibrated daily before use.

Calibration checks of field instruments will be performed three times daily and will be documented in a logbook specifically dedicated to field instrument calibration.

Critical spare parts such as probes, electrodes, batteries and standards will be kept on-site to minimize instrument down-time. Back-up instruments will be available on-site or within one-day shipment to avoid delays in the field schedule.

11.2 Laboratory Instruments

As part of their QA/QC Program, a routine preventive maintenance program is conducted by the laboratories to minimize the occurrence of instrument failure and other system malfunctions. NEI and the effluent laboratory will both have internal groups to perform routine scheduled maintenance, and to repair or to coordinate with the vendor(s) for the repair of all instruments.

All laboratory instruments are maintained in accordance with manufacturer's specifications and the requirements of the specific analytical methods being used. The maintenance will be carried out on a regular scheduled basis, and will be documented in the laboratory instrument service logbook for each instrument. NEI's specific maintenance procedures and schedule are outlined in Section 14.0 of their QAPP (Appendix I). Once the effluent laboratory has been selected, its specific maintenance procedures and schedule as defined in its QAPP will be attached to this QAPP, pending approval by the U.S. EPA.

12.0 DATA ASSESSMENT PROCEDURES

12.1 Field Data

Field data will be assessed for accuracy, precision, and completeness by the Implementor's QA Officer. Accuracy will be assessed using instrument-calibration and calibration-check data obtained on a daily basis. Precision will be assessed on the basis of reproducibility by comparing multiple readings from a single sample. At a minimum, multiple readings will be obtained every tenth measurement. Data completeness will describe the number of valid data measurements obtained as a percentage of the total number of data measurements planned.

12.2 Laboratory Data

All analytical data will be evaluated for precision, accuracy, completeness and sensitivity. The acceptability of the analytical precision and accuracy will be determined by comparing them to the control limits recommended in the CLP SOWs and methods being used for this project (i.e., OLM01.8 for organics, ILM03.0 for inorganics, the methods listed in Table 8 for the additional surface water parameters, and 40CFR136 for the Table 10 effluent parameters when established by BCDES). Data determined to be insufficiently precise or accurate will be subject to the corrective action prescribed by the appropriate analytical method. The QC samples used in the determination of precision and accuracy have been described in Section 9.0. Specific equations used to calculate precision, accuracy and completeness are presented below:

Precision will be expressed in terms of relative percent difference (RPD).

$$\text{RPD} = \frac{(\text{Concentration 1} - \text{Concentration 2})}{(\text{Concentration 1} + \text{Concentration 2})/2} \times 100$$

Accuracy as determined from the analysis of an external reference standard will be expressed as percent recovery (%R).

$$\% R = \frac{\text{Measured Concentration}}{\text{Actual Concentration}} \times 100$$

Accuracy as determined from the analysis of a spiked sample will also be expressed percent recovery.

$$\% R = \frac{(\text{Spiked Sample Concentration} - \text{Sample Concentration})}{\text{Concentration of Spike Added}} \times 100$$

Completeness will describe the number of usable analytical results as a percentage of the total number of results expected for the samples submitted for analysis.

$$\% \text{ Complete} = \frac{\text{Number of Usable Results}}{\text{Total Number of Results}} \times 100$$

Analytical sensitivity, or the achievement of method detection limits, depends on instrumental sensitivity and matrix effects. Thus, it is important to monitor instrumental sensitivity to ensure the data quality through constant instrument performance. The instrumental sensitivity will be monitored through the analysis of method blanks, calibration check samples and laboratory control samples.

13.0 CORRECTIVE ACTIONS

Corrective actions must be taken any time a situation develops that threatens data quality. Corrective action may be required if field or laboratory audits reveal unacceptable deviation from approved procedures. It may be required any time duplicate or spiked sample analyses exceed the QC limits or when blank analyses indicate unacceptable levels of contamination. Corrective actions for the field activities will be initiated as needed based on:

- o A daily review of the implementation of the field activities by the Field Team Leader;
- o A field sampling/data collection problem identified by a sampling team member;
- o A daily review of the field data by the Field Team Leader; and/or

- o A review of the field activities by other personnel.

Corrective actions will be initiated when:

- o The field investigations are not implemented per the RD FSP, RD AMP, RD CQAP, or the RD LTPP;
- o Site conditions require a modification to the identified sampling procedures in order to meet the Skinner Landfill DQOs;
- o Equipment fails to properly operate in the field; and/or
- o Field sampling and data collecting procedures warrant a corrective action.

Corrective actions of the field investigation will be approved by the PRP Group Project Administrator before implementation based on the recommendations from the PRP Group's Technical Manager, the Field Team Manager, or a sampling team member. Corrective actions will be initiated by the Field Team Leader and will be implemented by the appropriate personnel.

A corrective action may include immediate resampling and/or reanalysis of a few samples, or the cessation of all analyses with the subsequent resampling and/or reanalysis of all samples upon resolution of the problem.

Specific corrective actions for field measurements may include the following:

- o Repeat the measurement to check the error;
- o Check for all proper adjustments for ambient conditions such as temperature;
- o Check the batteries;
- o Check the calibration and adjust as necessary;
- o Replace the instrument or measurement devices; and/or
- o Stop work (if necessary).

Specific corrective actions for analytical measurements are described in the CLP SOWs being used for this project (i.e., OLM01.8 for organics and ILM03.0 for inorganics), the Laboratory QAPP's and procedures in Appendices IV, V, and VI for methods listed in Table 8 for the additional surface water parameters, and 40CFR136 for the Table 10 effluent parameters (when established by BCDES). Corrective actions are required whenever an out-of-control event or potential out-of-

control event is noted. The investigative action taken is somewhat dependent on the analysis and the event.

Laboratory personnel are alerted that corrective action may be necessary if:

- o QC data are outside the warning or acceptable windows for precision and accuracy;
- o Blanks contain target analytes above the acceptable levels;
- o Undesirable trends are detected in spike recoveries or RPD between duplicates;
- o There are unusual changes in detection limits;
- o Deficiencies are detected by the Laboratory QA Departments during internal or external audits or from the results of performance evaluation samples; and/or
- o Inquiries concerning data quality are received.

A QC problem that cannot be solved by immediate corrective action must be thoroughly investigated to determine the extent of the problem and to ensure that all samples affected by the problem are identified and analyzed.

14.0 QUALITY ASSURANCE REPORTS

Analytical data will be validated in accordance with the following U.S. EPA guidance documents:

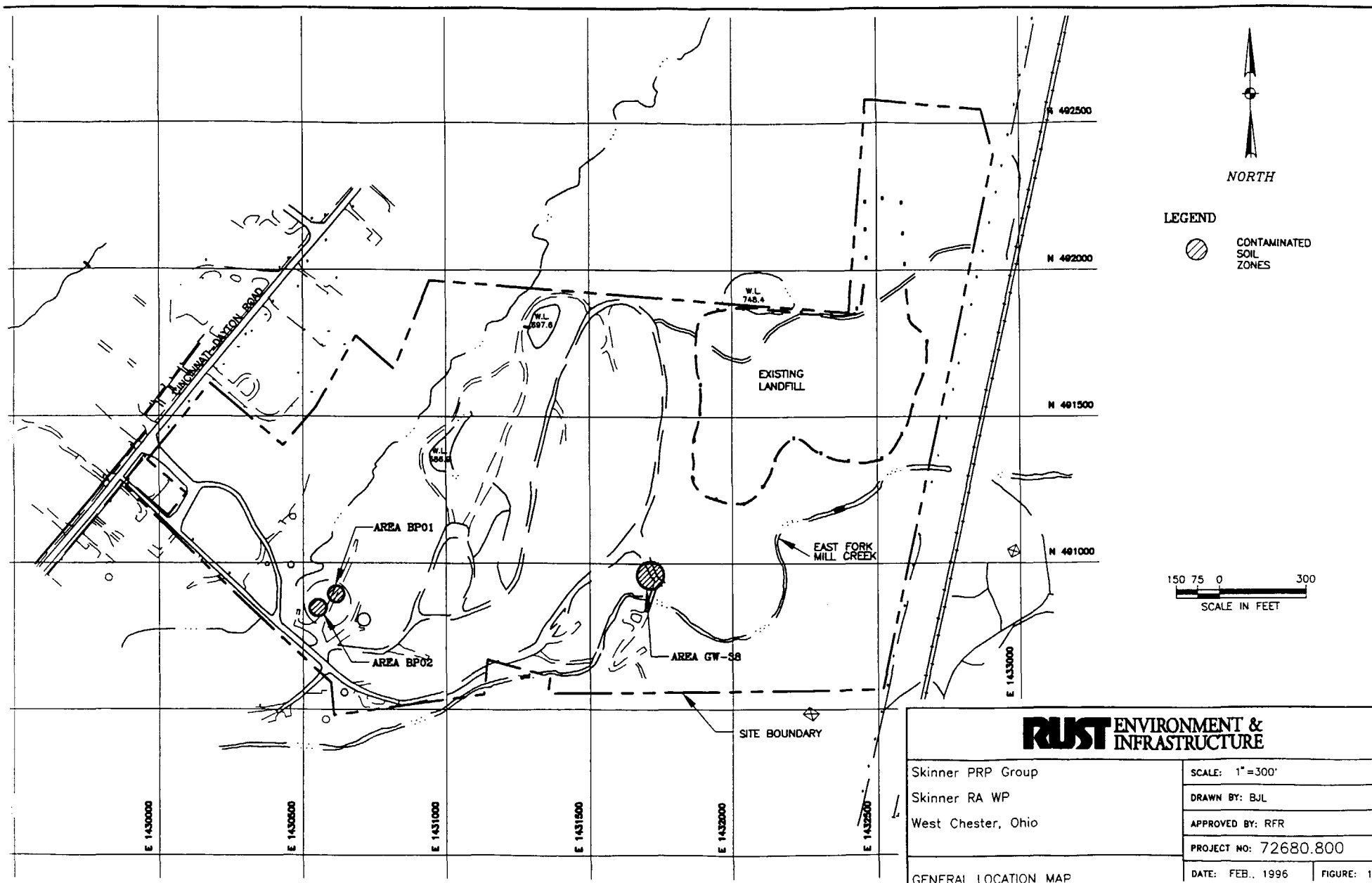
- o USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, February 1994.
- o USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994.

Summary QA Reports will accompany the analytical results from the RA sampling and analysis activities in a technical memorandum or project report when these are submitted to U.S. EPA. The QA Reports will include an assessment of data quality based on the QC data, as well as an account of any significant QA problems encountered and corrective action taken. The Implementor's QA Officer will be responsible for preparing the QA Reports. The QA reports and analytical data will be issued to the U.S. EPA RPM by the Implementor's Technical Committee Chairman.

Figures

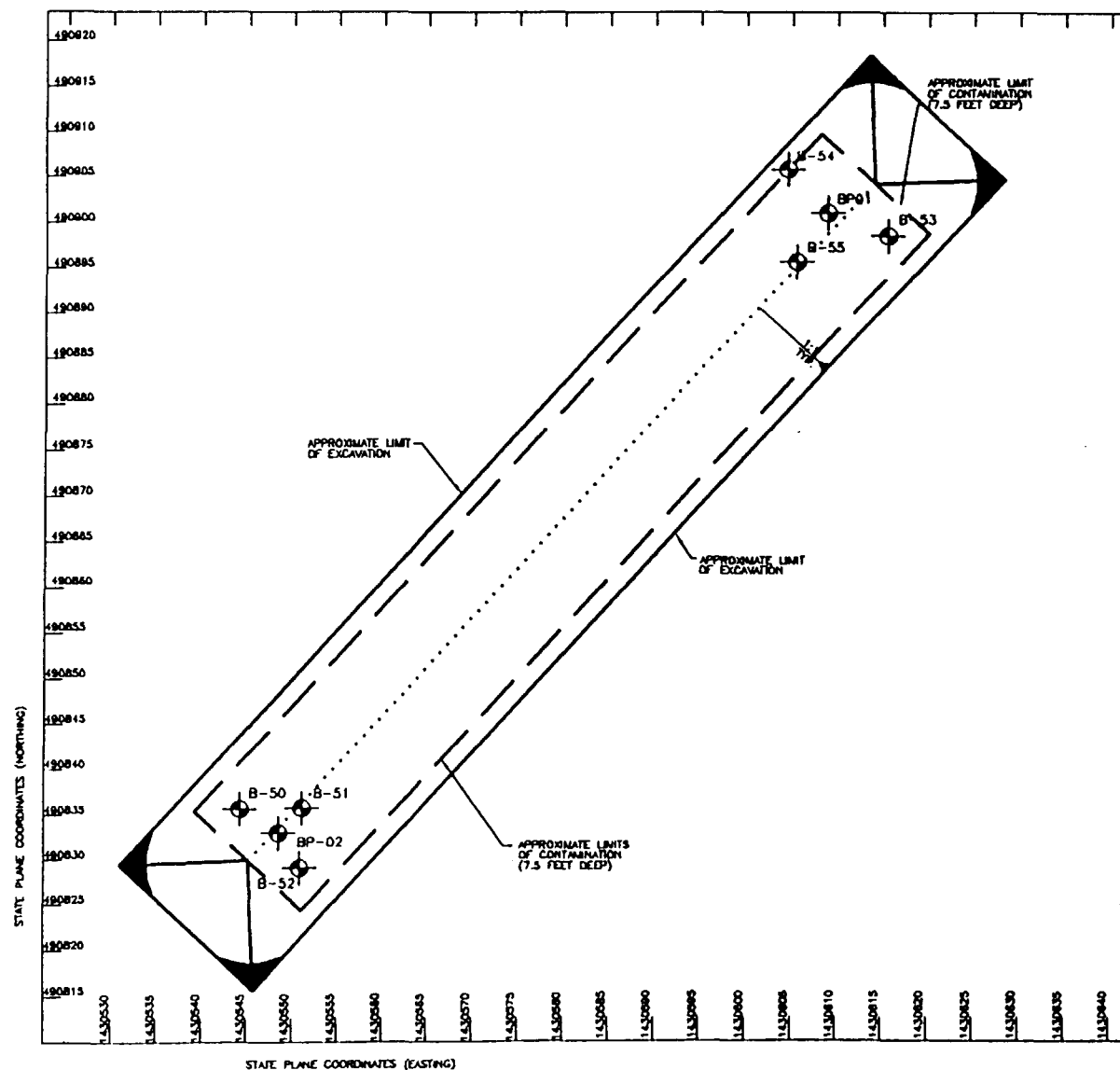
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NORTH



LEGEND:

..... 10 FOOT EXCAVATION LINE



Skinner PRP Group

Skinner RA WP

West Chester, Ohio

CONTAMINATED SOIL LIMITS- AREA BP01/BP02

RUST ENVIRONMENT & INFRASTRUCTURE

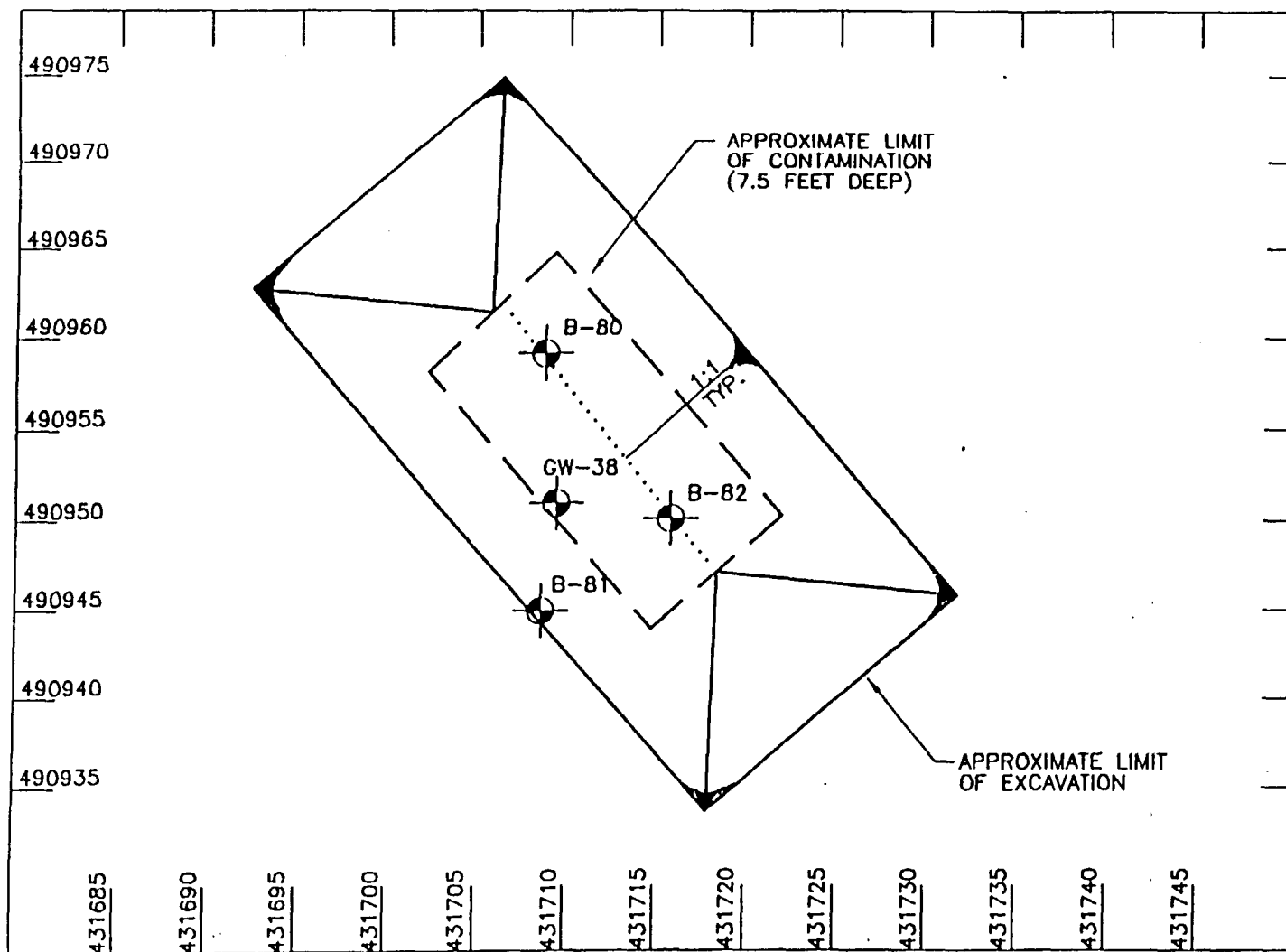
PROJECT NO. 72680.300 FIGURE 2

FILE: SKBP05.A**

DIR: 72680

PLOT DATE: 12/18/95

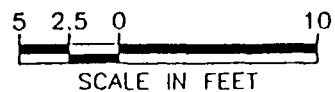
STATE PLANE COORDINATES (NORTHING)



STATE PLANE COORDINATES (EASTING)

LEGEND:

..... 10 FOOT
EXCAVATION LINE



Skinner PRP Group

Skinner RA WORK PLAN

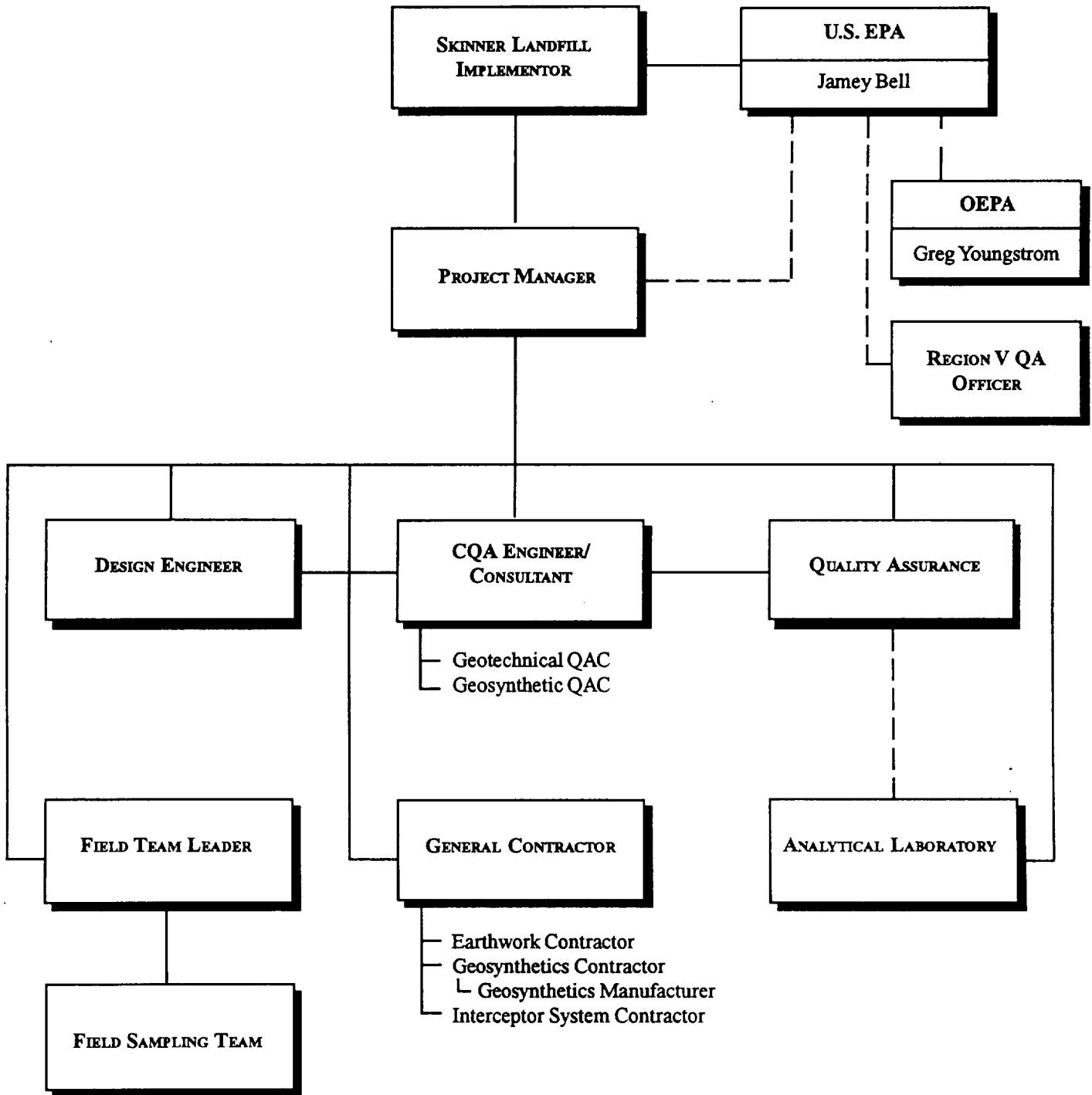
West Chesler, Ohio

CONTAMINATED SOIL LIMITS-AREA GW-38

RUST ENVIRONMENT &
INFRASTRUCTURE

PROJECT NO. 72680.300 FIGURE 3

NORTH



Skinner Landfill
Remedial Action
West Chester, Butler County, Ohio

RA QaPjP ORGANIZATION CHART

RUST

Rust Environment & Infrastructure

Project No. 72680.500 Figure 4

Tables

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TABLE 1

SKINNER LANDFILL REMEDIAL ACTION
SAMPLING AND ANALYSIS PROGRAM SUMMARY

Sample Matrix (1)	No. of Samples	Field Dups. (2)	Field Blanks (2)	MS/ MSD (3)	Trip Blanks (4)	Total Samples	Test Parameters (5)
Soil	19	2	2	1	-	24	TCL PCBs, TCL PAHs, and TAL Lead. See Table 7 for parameters.
Re-evaluate/Confirm Baseline Surface Water Conditions (at SW-50, SW-51, SW- 52 & SW-53) unfiltered (7)	4	1	1	1	1	8	See Tables 8 and 9 for parameters.
RA Construction Surface Water Monitoring, at SW-50, SW-51, SW-52, SW-53, & SW-54) unfiltered (6)	5	1	1	1	1	9	See Tables 8 and 9 for parameters.
Surface Water Run-off Monitoring unfiltered (6)	3	1	1	1	1	7	See Tables 8 and 9 for parameters.
Re-evaluate/Confirm Baseline Groundwater Monitoring Conditions, metals filtered and unfiltered (7)	11	2	2	1	1	17	See Tables 8 and 9 for parameters.

- Notes:
- (1) All samples are considered low/medium environmental samples.
 - (2) For surface water and run-off sampling , one field duplicate and one field blank will be collected during each sampling event. For other sampling, one field duplicate and one field blank will be collected every 10 or fewer investigative samples.
 - (3) MS/MSD consists of extra volume collected for one of the investigative samples. They will be collected at the rate of one for each surface water and out-fall sampling event and at the rate of one for every 20 or fewer investigative samples for other media. (Triple ADDITIONAL volume for VOCs, double ADDITIONAL volume for SVOCs). Laboratory duplicate analysis must be performed on an aliquot from the original one liter (1L) investigative sample container; no extra volume is required.
 - (4) One trip blank will be included with each shipment of aqueous VOC samples.
 - (5) Field parameters will be collected for aqueous samples and may include temperature, pH, specific conductance, and dissolved oxygen.
 - (6) Surface water run-off sampling will be done weekly until completion of the RA cover and trench/cut-off wall system construction activities. Samples listed are per sampling event. Run-off samples will only be collected after a rain event.
 - (7) Surface water and groundwater samples will be collected at selected sample locations at the end of the RA construction activities to re-evaluate and confirm the baseline conditions defined during the GWDI.

TABLE 2

SKINNER LANDFILL REMEDIAL DESIGN
SITE-SPECIFIC GROUNDWATER INTERCEPTION PARAMETERS AND
REVISED MODIFIED TRIGGER LEVELS

CONTAMINANT	CONCENTRATION (mg/L) (2)
<u>INORGANICS</u>	
Antimony	0.06
Arsenic	0.01
Barium	1.0
Beryllium	0.005
Cadmium	0.005
Chromium (total)	0.011
Copper	0.025
Cyanide	0.01
Iron	5.0
Lead	0.0042
Mercury	0.0002
Nickel	0.096
Selenium	0.005
Silver	0.01
Thallium	0.04
Zinc	0.086
<u>VOLATILES</u>	
Benzene	0.005
2-Butanone	0.0071
Carbon Tetrachloride	0.005
Chlorobenzene	0.026
Chloroform	0.079
1,2-Dichloroethane	0.005
1,2-Dichloroethene (cis) (1)	0.07

TABLE 2 - CONT

SKINNER LANDFILL REMEDIAL DESIGN
SITE-SPECIFIC GROUNDWATER INTERCEPTION PARAMETERS AND
REVISED MODIFIED TRIGGER LEVELS

CONTAMINANT	CONCENTRATION (mg/L) (2)
<u>VOLATILES - CONT</u>	
1,2-Dichloroethene (trans) (1)	0.01
1,2-Dichloropropane	0.005
Ethylbenzene	0.062
Styrene	0.056
1,1,2,2-Tetrachloroethane	0.107
Tetrachloroethene	0.005
Toluene	1.0
1,1,1-Trichloroethane	0.088
1,1,2-Trichloroethane	0.418
Trichloroethene	0.005
Vinyl Chloride	0.002
Xylenes (total)	10.0
<u>SEMI-VOLATILES</u>	
Acenaphthene	0.52
Benzo(a)anthracene	0.01
Benzo(b)fluoranthene	0.01
Benzo(k)fluoranthene	0.01
Benzo(g,h,i)perylene	0.01
Benzo(a)pyrene	0.01
bis(2-Chloroethyl)ether	0.0136
bis(2-Ethylhexyl)phthalate	0.049
Butylbenzylphthalate	0.01
Chrysene	0.01

TABLE 2 - CONT

SKINNER LANDFILL REMEDIAL DESIGN
SITE-SPECIFIC GROUNDWATER INTERCEPTION PARAMETERS AND
REVISED MODIFIED TRIGGER LEVELS

CONTAMINANT	CONCENTRATION (mg/L) (2)
<u>SEMI-VOLATILES - CONT</u>	
Dibenzo(a,h)anthracene	0.01
1,2-Dichlorobenzene	0.011
1,3-Dichlorobenzene	0.6
1,4-Dichlorobenzene	0.075
2,4-Dimethylphenol	2.12
Dimethyl phthalate	0.073
Di-n-butyl phthalate	0.19
Fluoranthene	0.01
Hexachloroethane	0.01
Indeno(1,2,3-cd)pyrene	0.01
Isophorone	0.9
Naphthalene	0.044
Nitrobenzene	27.0
4-Nitrophenol	0.15
2,2'-oxybis (1-Chloropropane)	4.36
Phenol	0.37
1,2,4-Trichlorobenzene	0.077
Phenanthrene	0.01

- (1) 1,2-Dichloroethene(cis) and 1,2-Dichloroethene(trans) will be reported as 1,2-Dichloroethene(total) during the RA field activities.
- (2) The concentrations shown in this table are not detection limits. CRQLs for these parameters are shown in Tables 4 through 8.

TABLE 3

SKINNER LANDFILL REMEDIAL DESIGN
PARAMETERS AND REMEDIAL TRIGGER LEVELS FOR
CONTAMINATED SOILS EXCAVATIONS

CONTAMINANT	CONCENTRATION (mg/Kg) (1)
Polychlorinated Biphenyls - Total	0.160
Benzo(a)anthracene	0.330
Benzo(a)pyrene	0.100
Benzo(b)fluoranthene	0.330
Benzo(k)fluoranthene	0.330
Chrysene	0.330
Lead	500.0

(1) The concentrations shown in this table are not detection limits. CRQLs for these parameters are shown in Tables 4 through 8.

TABLE 4

SKINNER LANDFILL REMEDIAL DESIGN
 TARGET COMPOUND LIST VOLATILES AND
 CONTRACT REQUIRED QUANTITATION LIMITS

		Quantitation Limits
Volatiles	CAS Number	Water (ug/L)
1. Vinyl Chloride	75-01-4	10
2. 1,2-Dichloroethene (total) (1)	540-59-0	10
3. Chloroform	67-66-3	10
4. 1,2-Dichloroethane	107-06-2	10
5. 2-Butanone	78-93-3	10
6. 1,1,1-Trichloroethane	71-55-6	10
7. Carbon Tetrachloride	56-23-5	10
8. 1,2-Dichloropropane	78-87-5	10
9. Trichloroethene	79-01-6	10
10. 1,1,2-Trichloroethane	79-00-5	10
11. Benzene	71-43-2	10
12. Tetrachloroethene	127-18-4	10
13. Toluene	108-88-3	10
14. 1,1,2,2-Tetrachloroethane	79-34-5	10
15. Chlorobenzene	108-90-7	10
16. Ethyl benzene	100-41-4	10
17. Styrene	100-42-5	10
18. Xylenes (total)	1330-20-7	10

(1) Table 2 reports 1,2 - Dichloroethene (total) as 1,2 - Dichloroethene (cis) and 1,2 - Dichloroethene (trans).

TABLE 5

SKINNER LANDFILL REMEDIAL DESIGN
TARGET COMPOUND LIST SEMI-VOLATILES AND
CONTRACT REQUIRED QUANTITATION LIMITS

Semi-volatiles (2)	CAS Number	Quantitation Limits	
		Water (ug/L)	Soil/Sediment (mg/Kg) (1)
1. Phenol	108-95-2	10	330
2. bis(2-Chloroethyl) ether	111-44-4	10	330
3. 1,3-Dichlorobenzene	541-73-1	10	330
4. 1,4-Dichlorobenzene	106-46-7	10	330
5. 1,2-Dichlorobenzene	95-50-1	10	330
6. 2,2'-oxybis-(1-Chloropropane) (3)	108-60-1	10	330
7. Hexachloroethane	67-72-1	10	330
8. Nitrobenzene	98-95-3	10	330
9. Isophorone	78-59-1	10	330
10. 2,4-Dimethylphenol	105-67-9	10	333
11. 1,2,4-Trichlorobenzene	120-82-1	10	330
12. Naphthalene	91-20-3	10	330
13. Dimethylphthalate	131-11-3	10	330
14. Acenaphthene	83-32-9	10	330
15. 4-Nitrophenol	100-02-7	25	800
16. Phenanthrene	85-01-8	10	330
17. Di-n-butyl phthalate	86-74-2	10	330
18. Fluoranthene	206-44-0	10	330
19. Butyl benzyl phthalate	85-68-7	10	330
20. <u>Benzo(a)anthracene</u>	56-55-3	10	333
21. <u>Chrysene</u>	218-01-9	10	330
22. bis(2-Ethylhexyl)phthalate	117-81-7	10	330
23. <u>Benzo(b)fluoranthene</u>	205-99-2	10	330
24. <u>Benzo(k)fluoranthene</u>	207-08-9	10	330
25. <u>Benzo(a)pyrene</u>	50-32-8	10	330
26. Indeno(1,2,3-cd)pyrene	193-39-5	10	330
27. Dibenzo(a,h)anthracene	53-70-3	10	330
28. Benzo(g,h,i)perylene	191-24-2	10	330

- (1) Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the protocol, will be higher.
- (2) Underline parameters are the site specific parameters of interest defined in the ROD and RD SOW as listed in Table 3.
- (3) Previously known by the name bis(2-Chloroisopropyl) ether.

TABLE 6

SKINNER LANDFILL REMEDIAL DESIGN
TARGET COMPOUND LIST PESTICIDES & PCBs AND
CONTRACT REQUIRED QUANTITATION LIMITS

		Quantitation Limits	
Pesticides/Aroclors	CAS Number	Water (ug/L)	Soil/Sediment (mg/Kg) (1)
1. AROCLOR-1016	12674-11-2	1.0	33.0
2. AROCLOR-1221	11104-28-2	0.5	67.0
3. AROCLOR-1232	11141-16-5	0.5	33.0
4. AROCLOR-1242	53469-21-9	1.0	33.0
5. AROCLOR-1248	12672-29-6	1.0	33.0
6. AROCLOR-1254	11097-69-1	1.0	33.0
7. AROCLOR-1260	11096-82-5	1.0	33.0

(1) Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the protocol, will be higher.

TABLE 7

SKINNER LANDFILL REMEDIAL DESIGN
TARGET ANALYTE LIST INORGANICS AND
CONTRACT REQUIRED QUANTITATION LIMITS

Analyte (4)	Contract Required (1, 2, 3) Quantitation Limit (ug/L)
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Chromium	10
Copper	25
Iron	100
<u>Lead</u>	3
Mercury	0.2
Nickel	40
Selenium	5
Silver	10
Thallium	10
Zinc	20
Cyanide	10

- (1) Higher detection limits may only be used if the sample concentration exceeds five times the detection limit of the instrument or method in use. The value may be reported even though the instrument or method detection limit may not equal the CRQL. This is illustrated in the example where the value of 220 may be reported even though the instrument detection limit is greater than the CRQL.

For lead: Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample Concentration = 220
CRQL = 3

- (2) The CRQL's are the instrument detection limits obtained in pure water. The detection limits for samples may be considerably higher depending on the sample matrix.
- (3) The CRQL's for soils = 200 times CRQL's for water.
- (4) Underlined parameter is the site specific parameter of interest defined in the ROD and RD SOW as listed in Table 3.

TABLE 8

SKINNER LANDFILL REMEDIAL DESIGN
ADDITIONAL SURFACE WATER PARAMETERS
AND CONTRACT REQUIRED QUANTITATION LIMITS

PARAMETER	ANALYTICAL METHOD	DETECTION LIMIT (mg/L)
Biochemical Oxygen Demand	EPA 405.1	3.0
Ammonia Nitrogen	EPA 350.1	0.05
Total Dissolved Solids	EPA 160.1	10.0
Total Suspended Solids	EPA 160.2	1.0
Oils and Grease	EPA 413.1	1.0

TABLE 9

SKINNER LANDFILL REMEDIAL DESIGN
PREVENTIVE MAINTENANCE SCHEDULE

Instrument Type/Model Number	Manufacturer/Supplier	Preventative Maintenance Check/Service Call to Manufacturers
pH Meter Model 607 Model 5985-80 Model 123133 - Unit 1	Fisher Cole Parmer Beckman	Monthly/Annual Monthly/Annual Monthly/Annual
Conductivity Meter Model 33	YSI	Monthly/Annual
Dissolved Oxygen Meter Model 55 Model 57	YSI YSI	Monthly/Annual Monthly/Annual
Beta and Gamma Radiation Model 190	Victoreen	Variable (1)Annual Calibration at Man.

- (1) The Beta and Gamma Radiation Detector will be supplied HAZCO. HAZCO conducts preventive maintenance on the Victoreen Model 190 each time the detector is returned to their office after its use in the field.

TABLE 10

SKINNER LANDFILL REMEDIAL DESIGN
PARAMETERS TO BE ANALYZED FOR
DISCHARGE TO BCDES

NOTE: This table will be completed when BCDES issues authorization to discharge.

1

1

APPENDIX I

**SELECTED SECTIONS FROM NEI
QUALITY ASSURANCE PROGRAM PLAN (SECTIONS 4, 10, 14 AND 23)**

SECTION 4.0
ORGANIZATION AND RESPONSIBILITY

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4.0 Organization and Responsibility

4.1 Capabilities

Nytest Environmental Inc. (NEI) is an environmental laboratory equipped to analyze samples of various matrices (soil, water, oil, air, etc.) for a variety of chemical properties. NEI is offering the services of its laboratory to evaluate the potential organic and inorganic levels of contamination of potentially hazardous waste samples.

4.2 Individual Duties

4.2.1 Contract Administrator

Upon receipt of a Request for Proposal or Contract Agreement, the Contract Administrator will:

- a. Review and prepare a proposal detailing how the program will be implemented by NEI including but not limited to....analytical procedures, pricing, subcontracting (if required) and the Terms and Conditions.
- b. Review and sign all contract agreements including confidentiality agreements, if required.
- c. Prepare a statement of work for the laboratory.
- d. Address all non-conforming subcontracted services.
- e. Address all contractual issues with the client during and after the program has been implemented.

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4.0 Organization and Responsibility - continued

4.2.2 Laboratory Operations Manager

Upon receipt of the statement of work or Client Quality Assurance Project Plan from the Contract Administrator, the Laboratory Operations Manager will:

- a. Review the program entering the laboratory. The Laboratory Operations Manager will report to the Contract Administrator on matters of work in progress or discuss issues of concern for incoming work.
- b. Coordinate and establish a work flow plan with his subordinates and have periodic progress meetings.
- c. Provide clear written instructions to questions regarding the actual test work. The instructions may be in the form of specifications, reference material or written instructions.
- d. Review the test setup, instrumentation, method of recording data, to assure that all measurements and tests are being performed to appropriate test specifications. Any problems relative to the test program are resolved in consultation between the Laboratory Operations Manager and the parties involved.

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4.0 Organization and Responsibility - continued

- e. Provide information and direction to the following personnel: Inorganic and Organic Laboratory managers, department supervisors, analysts and specialists.
- f. Keep abreast of new technologies, attend meetings, seminars initiate and coordinate in-house R&D programs.

4.2.3 Quality Control Manager

The quality control for the analytical work is established by the Quality Control Manager under the guidelines of the EPA "Handbook for Analytical Quality Control in Water and Wastewater laboratories" and the ISO 25 Guide. The Quality Control Manager's responsibilities include:

- a. Maintain the established QC Standards.
- b. Examine the QA/QC records of all analysts to insure that all performance criteria are achieved. These records include:
 - Chain-of-custody
 - Instrument performance
 - Calibration Standards
 - Surrogate recoveries
 - Matrix Spike Recoveries
 - Duplicate Analysis
- c. Assess the Quality Assurance Program.
- d. Approve Changes or Additions to the Quality Assurance Program.
- e. Review analytical results with the Laboratory Managers.
- f. Provide input to the Laboratory Manager and Project Manager on Quality Assurance issues.
- g. Maintain an awareness of new analytical technologies.
- h. Review bound logbooks and sample documentation.

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4.0 Organization and Responsibility - continued

- i. Establish an audit system.
- j. Coordinate the in-house proficiency evaluation test program.
- k. Report any discrepancies when found to both the Laboratory Operations Manager and the President.
- l. Review these discrepancies and recommend appropriate corrective actions to the department supervisors and analysts.
- m. Direct the QC technicians to prepare check samples.
- n. Train QC technicians to examine analytical data for QC discrepancies using established statistical techniques.
- o. Submit monthly reports identifying recurring QA/QC discrepancies and recommending policy and procedural changes which will eliminate those faults.

4.2.4 Sample Custodian

- a. Receive all incoming samples. Insure each sample is tagged (and accompanied by a chain-of-custody record) with the following information:

Client Number
Sample Number
Site Designation
Preservative, if any
Sample collectors' signatures
Analysis to be performed
Sampling date
Date of sample receipt in laboratory

- b. Continue chain-of-custody by signing for properly labelled samples.
- c. Insure samples are properly stored.
- d. Inform department supervisors that samples have arrived.

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4.0 Organization and Responsibility - continued

- e. Note on chain-of-custody any visible discrepancies in sample handling.
- f. Issue samples to analysts upon request of departmental supervisors.
- g. Obtain analyst's signature on chain-of-custody form at the start of day's work. Sign for returned samples.
- h. Request disposal instructions from Laboratory Manager 30 days after analysis.
- i. Close out chain-of-custody forms and store with the appropriate client file when samples are disposed or returned to clients.

4.2.5 Organic and Inorganic Managers

- a. Review the program entering his department and enter the program.
- b. Establish a work schedule with the Laboratory Manager.
- c. Supervise the logging in and distribution of samples within his department.
- d. Coordinate and establish a work flow plan with his subordinates and have periodic progress meetings.
- e. Review the final test report for review by QC and the Laboratory Manager.
- f. Review and verify the data submitted by the department Supervisors.
- g. Develop and implement training programs for the department personnel.

4.2.6 Department Supervisors

- a. Review the test program entering his department.
- b. Establish a work schedule with the department manager.

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4.0 Organization and Responsibility - continued

- c. Direct the analyses.
- d. Review all data, including Chain-of-Custody forms before submission to department manager.

4.2.7 Semi-Volatile Specialist

- a. Operation of the GC/MS for the determination of Base Neutrals and Acid Extractable parameters using protocols of EPA Methods and related client specified protocols.
- b. Generation of background data to support analytical findings including spectra and library search.
- c. Calculation of final parameter concentrations and surrogate recoveries.
- d. Spiking final extracts with internal standards.
- e. Maintenance of instrument operation logs.
- f. Preparation of working calibration and performance standards from stock standards.
- g. Confirmation of pesticide identification, when concentrations are sufficiently high.
- h. Assemble the final data package, including case narratives.

4.2.8 Purge and Trap Specialist

- a. Operation of GC/MS for the determination of volatile parameters using EPA Methods and related client specified protocols.
- b. Generation of background data to support analytical findings, including spectra and library searches.
- c. Calculation of final concentrations and surrogate recoveries.
- d. Maintenance of instrument operation logs.

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4.0 Organization and Responsibility - continued

- e. Preparation of working calibration and performance standards from stock solutions.
- f. Assemble the final data package, including the case narratives.

4.2.9 Extraction Technicians

- a. Extraction of Base Neutral, Acid Extractable and Pesticide/PCB fractions from soils and waters.
- b. Chromatographic cleanup of each fraction.
- c. Concentration of extracts.
- d. Spiking samples with surrogates and matrix spike standards.
- e. Maintenance of extraction lab logbook.

4.2.10 GC Analysts

- a. Analysis of concentrated extracts for pesticides/PCB's according to EPA Methods or other client specified protocols.
- b. Generation of background data to support analytical findings, including performance standard and calibration.
- c. Maintenance of all instrument logbooks.
- d. Provide the department supervisor with the test data.
- e. Assemble the data package and initial case narratives.

4.2.11 Metals Technician

- a. Analysis of sample for metals concentration by EPA or other client specified protocols.
- b. Generation of background data to support analytical findings, including performance standard and calibration.

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4.0 Organization and Responsibility - continued

- c. Calculation of final concentrations.
- d. Maintenance of all instrument logbooks.
- e. Provide the department supervisor with all test data.

4.2.12 Wet Chemistry Technician

- a. Analysis of sample for various chemical and physical properties in accordance with EPA or other client specified protocols.
- b. Generation of background data to support analytical findings, including performance standard and calibration.
- c. Calculation of final concentrations.
- d. Maintenance of all instrument logbooks.
- e. Provide the department supervisor with all test data.

4.2.13 Data Review/Report Production Manager

- a. Supervise, schedule and follow-up on projects that require review, report production and data entry.
- b. Perform review of data generated by the various departments.
- c. Advise Laboratory Manager of projects that fall behind schedule.
- d. Prioritize work based on Production Schedule.
- e. Implement new protocol requirements for reports.

4.2.14 Customer Service Manager

- a. Responsible for the liaison between the laboratory and the client.
- b. Interfaces with all subcontracts with respect to project status and or difficulties.

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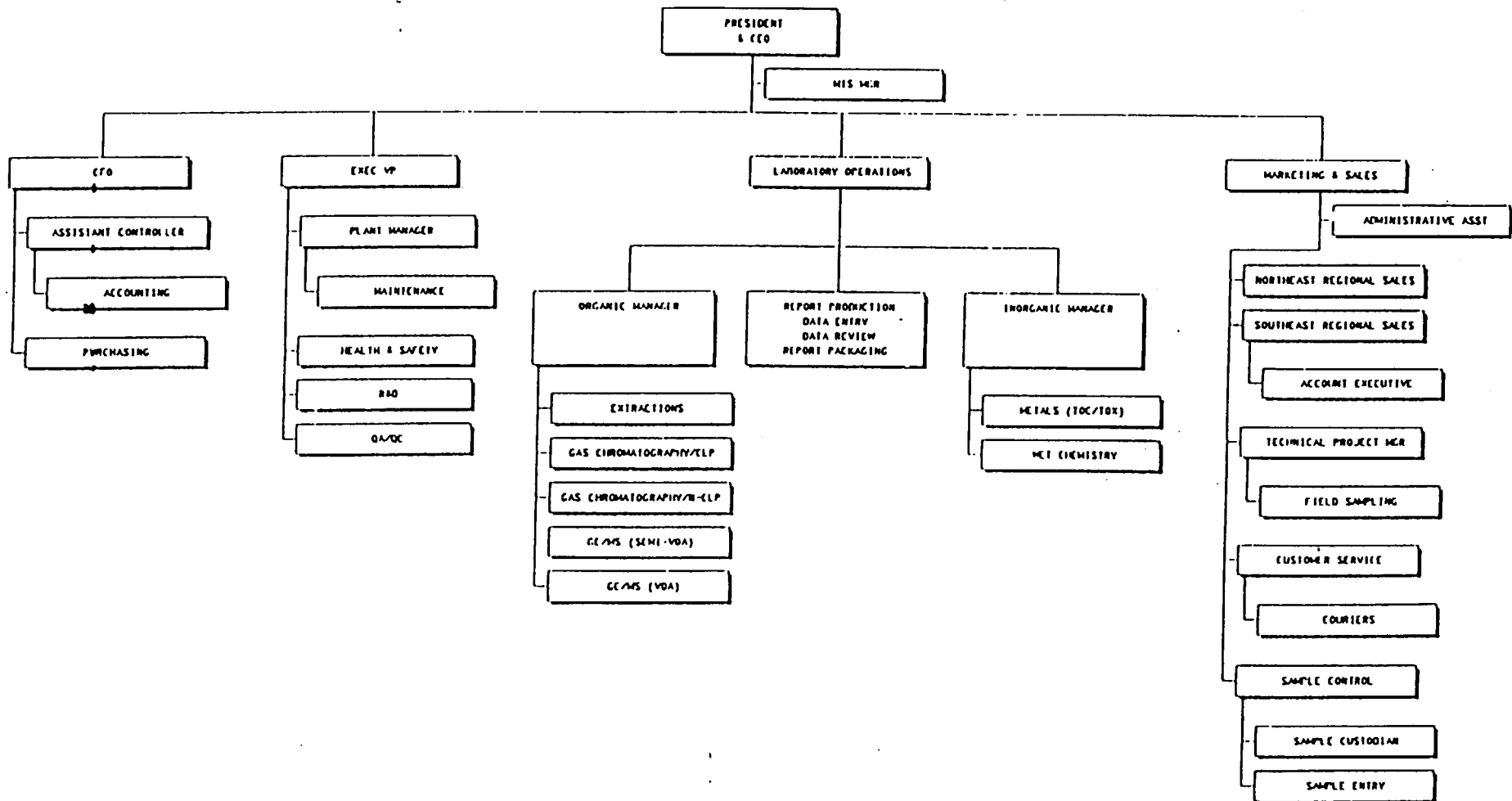
4.0 Organization and Responsibility - continued

- c. Handles all clients requests with respect to status, questions or complaints. The requests are recorded in a log book and distributed to the appropriate level of management for disposition.

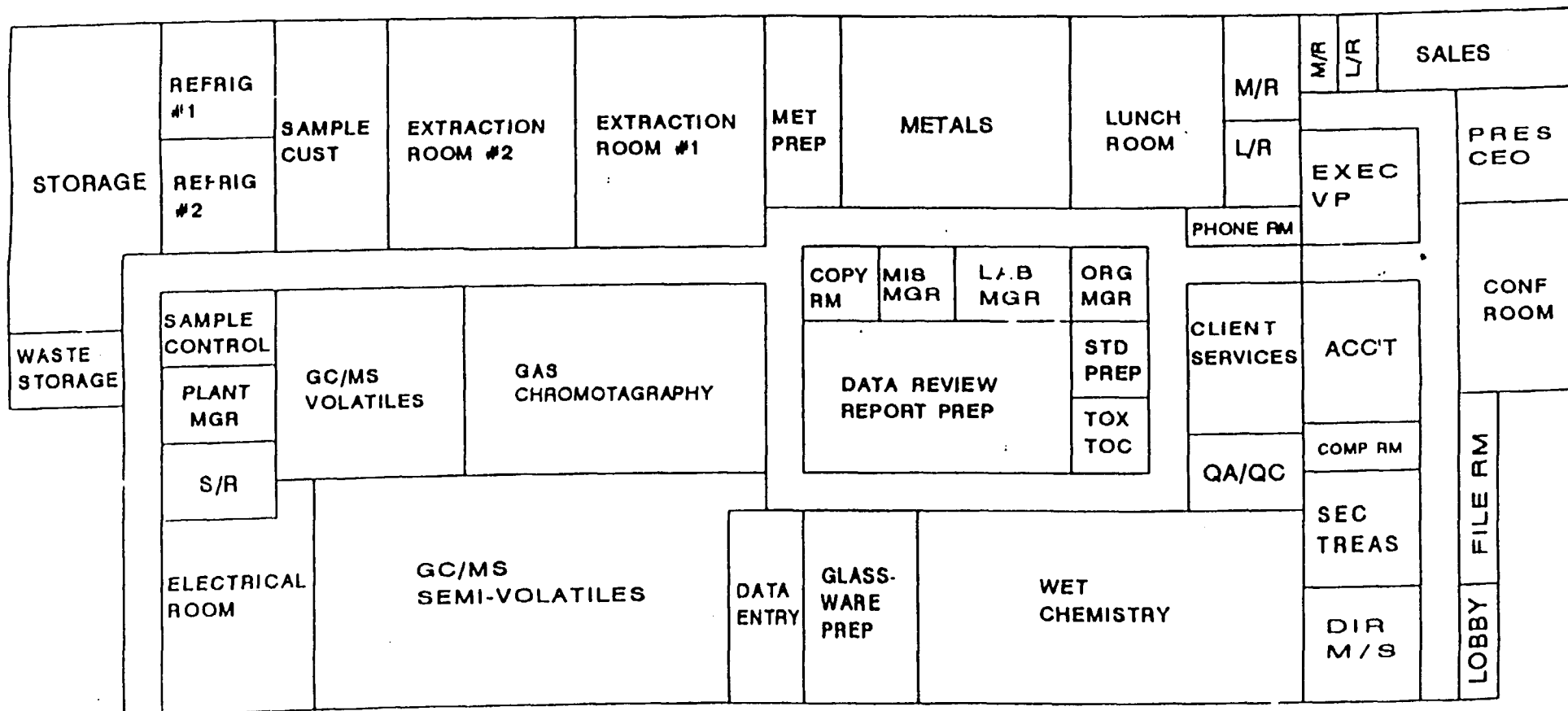
4.3 Organization Chart: See Following Page

4.4 Laboratory Floorplan: See Following Page

NEI ORGANIZATIONAL STRUCTURE



Laboratory Floorplan



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SECTION 10.0
SAMPLE IDENTIFICATION AND STORAGE

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10.0 Sample Identification and Storage

10.1 Standard Operating Procedures for Sample Identification

In order to maintain sample identity, each sample is assigned a unique sample identification (sample ID) number.

10.1.1 All samples are assigned a Sample ID number. This number consists of the laboratory login number, followed by a two-digit number increased sequentially for each sample in that case.

10.1.2 Sample containers (i.e. bottles and extract vials) are clearly identified with the following information:

Client Name
Sample ID Number (NEI Number)
Date Collected
Date Received
Client ID
Analysis Required
Preservative (if applicable)

10.2 Standard Operating Procedures for Sample Storage

10.2.1 Samples and extractts are stored in a secure area designated for client samples.

10.2.1.1 Walk-in refrigerator #1 located in the Sample Receiving Room (Sample Storage)

10.2.1.2 Walk-in refrigerator #2 located in the Sample Receiving Room

10.2.2 The samples are removed from the shipping container and stored in their original containers unless damaged.

10.2.3 Damaged samples are disposed of as per NEI SOP.

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10.0 Sample Identification and Storage - continued

- 10.2.4 The storage area is kept secure at all times. The Sample Custodian controls access to the storage area. (Duplicate keys for locked storage areas are maintained only by the appropriate personnel).
- 10.2.5 Whenever samples are removed from storage, the removal is documented on the internal Chain of Custody form DEP077 (or equivalent). All transfers of samples are documented on this form (or equivalent).
- 10.2.6 Samples are stored in the walk-in coolers after completion of analysis and submission of the report for 60 days.

10.3 Chain of Custody Requirements and Laboratory/Sample Security

- 10.3.1 Samples are stored in a secure area.
- 10.3.2 Access to the laboratory is limited through a monitored area (Sample Receiving/Sample Custodian room). Other outside-access doors to the laboratory are kept locked.
- 10.3.3 Refrigerators, freezers, and other sample storage areas in the Sample Control Room are securely maintained. The temperatures are recorded daily by the Sample Custodian.
- 10.3.4 Only the designated Sample Custodian and the supervisory personnel have keys to locked sample storage areas.
- 10.3.5 Samples remain in secure sample storage areas until removed for sample preparation, analysis, or disposal.
- 10.3.6 All transfers of samples into and out of storage is documented on an internal Chain of Custody form (DEP077).
- 10.3.7 For receipt of samples after hours, NEI has a Sample Custodian available until 5:30 pm.

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10.0 Sample Identification and Storage - continued

10.3.8 Historical internal custody records are maintained in the case files.

10.3.9 After a sample has been removed from storage by the analyst, the analyst is then responsible for the custody of the sample. Each analyst must return the samples to the storage area before the end of the working day or prior to the end of his/her shift. The Sample Custodian will retrieve samples on a daily basis.

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SECTION 14.0
INSTRUMENT CALIBRATION
AND
PREVENTIVE MAINTENANCE

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14.0 Calibration Procedures and Frequency

Instrumentation Performance Criteria, Reference and Frequencies

14.1 Standard Receipt and Traceability

- 14.1.1 Standards are ordered by purchase request form from the manufacturer. The standards are received by the shipping/receiving officer and distributed to the appropriate department head.
- 14.1.2 Standards are stored either:
 - a. in the individual laboratories in cabinets or refrigerators specifically designated for that purpose;
 - b. or in the standard preparation room in cabinets or refrigerators specifically designated for that purpose.
- 14.1.3 The standards are prepared by the individual technician performing the analysis or by a technician designated by the department supervisor as the standard prep technician (see table below). The preparation of all standards are logged into a standard preparation logbook located in each individual laboratory. The information logged in to the standard preparation logbook must include:
 - a. Standard Name
 - b. Standard concentration
 - c. Standard Preparation Date
 - d. Standard Source
 - e. Standard Expiration Date
 - f. Standard Lot Number
 - g. Initials of the technicians preparing the standard.
- 14.1.4 The manufacturers' certifications and traceability statements are maintained by the individual labs receiving the standards.

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Standard Sources and Preparation

Group	Standard	Manner	Source	Preparation	Lab	Instrument

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14.2 Volatile Organics - Instruments are calibrated with by analyzing five (5) standards and a blank. Each shift, prior to analyzing samples, a solution containing 50 ng of p-Bromofluoro-benzene (BFB) is purged. The observed fragmentation pattern is compared to the performance criteria defined in appropriate Register dated Method. If the criteria are not met, the Mass Spectrometer is retuned and recalibrated. Continuous calibration check (CCC) standards are run and QC criteria met before analyzing samples. CCC are run every 12 hours. Detailed QC refer to NEI specific SOP's Methods.

14.3 Base/Neutral Fraction - Instruments are calibrated by analyzing five (5) standards and a blank. At the beginning of each shift, before Base/Neutral analyses are performed, operation of the GC/MS system is verified by tuning to compliance of DFTPP Specifications as defined in the appropriate Method. CCC standards are run and QC criteria met before analyzing samples. CCC are run every 12 hours. Detailed QC refer to NEI specific SOP's Methods.

14.4 Acid Fraction - Instruments are calibrated by analyzing five (5) standards and a blank. At the beginning of each shift, when acid extracts are analyzed, operation of the GC/MS system is verified by tuning to compliance of DFTPP Specifications as defined in the appropriate Method. CCC standards are run and QC criteria met before analyzing samples. CCC are run every 12 hours. Detailed QC refer to NEI specific SOP's Methods.

14.5 Pesticide/Herbicide - Instruments are calibrated by analyzing five (5) standards and a blank. A linearity calibration curve is constructed by analyzing five (5) standards spanning the anticipated range of the samples to be analyzed. Samples falling outside the linear range of the detector are diluted or concentrated and reanalyzed. CCV Standards are run and QC criteria met before analyzing samples. CCV are analyzed in accordance with the specific methods.

14.6 Metals - Guidelines established in specific SOP's will be strictly followed. Note: Instruments must be calibrated daily or once every 24 hours and each time the instrument is set up. The date and time of standardization must be included in the raw data.

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14.8 AA Systems

Standard must be prepared at the time of analysis.
Prepare as follows:

<u>Instrument</u>	<u>STD 1</u>	<u>STD 2</u>	<u>STD 3</u>
-------------------	--------------	--------------	--------------

Z3030

Pb	25.0	50.0	100.0
As	25.0	50.0	100.0
Se	25.0	50.0	100.0
Tl	15.0	50.0	100.0

A minimum of three standards must be run. A fourth standard at the CRDL level must be run immediately after calibration (except for mercury). This standard must return a value at or above the IDL level.

The standards must be prepared fresh each time the analysis is to be made and discarded after use.

For acceptance criteria, see specific SOP's.

14.9 ICP Systems

Calibrate the instrument by running one blank, and the third a freshly prepared standards solution from ultra high purity grade metals.

For. exceptance criteria, see CLP 390.

14.10 Cyanide and Hexavalent Chromium

a. CLP Cyanide

The analyst must prepare a minimum of 5 standards and a blank. One of the standards must be at the CRDL level. Prepare the standards at the following levels:

Std 0	Std 3
Std 1	Std 4
Std 2	Std 5

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b. Hexavalent Chromium

Each day, prior to analyzing samples, a set of 5 standards are analyzed and quantitation is based on a linear regression program (correlation coefficient ≥ 0.995).

14.6 Additional Parameters

14.6.1

checked daily with at least one (1) class "P" weight, weekly with at least two (2) class "P" weights. Balances are certified annually by a qualified serviceman. "P" weights are verified annually against "S" weights.

14.6.2 Titrimetric analyses: Automatic titrators are standardized each day prior to use.

14.6.3

performing colorimetric analyses, a set of five (5) standards are analyzed and quantitation is based on a linear regression.

14.7 Meters

14.7.1 pH meters are calibrated daily with 4.00, 7.00 and 10.00 buffers.

14.7.2 Results of all calibrations will be maintained by the laboratory in bound log books.

14.8 Preventive Maintenance Procedures and Schedules

Maintenance schedules adhere to the manufacturer's recommendations. Records reflect the complete history of each instrument and specify the time frame for future Colorimetric Analysis: Each day, prior to routine maintenance. An extensive inventory of spare parts is on hand to minimize equipment/instrument down time.

Major repairs or maintenance procedures are performed through service contracts with manufacturer or qualified contractors.

All paper work associated with service calls and preventive maintenance calls are kept on file by the laboratory.

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Each laboratory supervisor is responsible for the routine maintenance of instruments used in the particular lab. Any routine preventative maintenance carried out is logged into the appropriate logbooks. The frequency of routine maintenance is dictated by the nature of samples being analyzed, the requirements of the method used and/or the judgement of the laboratory supervisor/manager/director.

The following preventative maintenance procedures are carried out:

Atomic Absorption: Clean the furnace head, check status of contact rings, replace cuvettes with new ones.

Cold Vapor AA: Check/change the gas, change the drying tube, pump tubing, and optical cell.

ICP: Clean the torch, change the pump tube, change the mirror.

Technicon/Lachat Auto Analyzers:

Random Access Sampler

Keep the Sampler dry and clean. Keep the sample boats clean and pressed firmly in place. Loosen the sensor and clean it with a cotton swab.

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Proportioning Pump

Every 50 hours of use (or 2500 samples), spray a lint free cloth with a silicone spray and hold against the rollers. This will give your pump tubes a longer life.

Injection Module

Every 500 hours of use (or 25,000 samples):

1. Replace the flares at each port of the valve.
2. Clean the unions at each port of the valve and replace the O-rings, if necessary and,
3. After removing the flare/union assemblies from the valve, clean each port of the valve with a wet cotton swab.

*** CAUTION: DO NOT OVERTIGHTEN VALVE FITTINGS.**

Manifolds

Follow recommended cleaning procedures. In addition, every 500 hours of use (or 25,000 samples), clean each fitting and replace O-rings as necessary.

Colorimeter

Keep dry and clean

Computer

Every 500 hours of use (or 25,000 samples), use "Cleandisk" in the "Other Options" screen to back up your data and make more room on your hard disk.

*** NOTE: HAVE FORMATTED DISKS READY BEFORE ENTERING "CLEANDISK"**

14.9 Contingencies for Unscheduled Downtime

All major instruments are backed up by comparable (if not equivalent), instrument systems in the event of un-scheduled downtime.

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14.10 Standard Operating Procedures for Maintaining Instrument Records and Logbooks

14.10.1 The logbooks must be maintained in a neat and orderly fashion.

14.10.2 The entries to the logbooks must follow in chronological order.

14.10.3 All corrections must be made by striking the incorrect entry with a single line, and dating and initialing all corrections.

14.10.4 All logbook pages must be bound. Pages are never to be removed from the logbooks.

14.10.5 All logbooks must remain in the laboratory at all times. Logbooks are not to leave the premises.

14.10.6 All logbooks must be signed and dated by the person performing the analysis.

14.10.7 Blank pages not used by the analyst must be struck out with a single line and dated by the analyst.

14.10.8 Instrument records: All instrument records are the responsibility of the analyst generating the raw data. When appropriate, the raw data will be photocopied and sent with the report. The originals will be filed, available for inspection.

SECTION 23

DATA REDUCTION, VALIDATION AND REPORTING

23.0 Data Reduction

- 23.1 Standard Operating Procedures for Maintaining Instrument Records and Logbooks (Documentation Records)
- 23.1.1 All logbooks are the responsibility of the technicians assigned to that particular task. The following are guidelines for the typical logbook. They apply to both laboratory logbooks and the field sampling logbooks.
- a. The logbooks must be maintained in a neat and orderly fashion.
 - b. The entries to the logbooks must follow in chronological order.
 - c. All corrections must be made by striking the incorrect entry with a single line, and dating and initialing all corrections.
 - d. All logbook pages must be bound. Pages are never to be removed from the logbooks.
 - e. All logbooks must remain in the laboratory at all times. Logbooks are not to leave the premises. Field sampling logbooks must be returned to the laboratory after the sampling event.
 - f. All logbooks must be signed and dated by the person performing the analysis/sampling.
 - g. Blank pages not used by the analyst must be struck out with single line and dated by the analyst.
- 23.1.2 All instrument records are the responsibility of the analyst generating the raw data. When appropriate, the raw data will be photocopied and sent with the report. The originals will be filed, available for inspection. This includes Chromatograms, Strip chart recordings, Computer printouts, and any other permanent record of the analysis.
- 23.1.3 Calculations are performed by the instrument, or by the analyst (Linear regressions and Logarithmic regressions) with the aid of a scientific calculator.
- 23.1.4 Once their review is complete, data is to be turned in to the Data Review section of the laboratory by the department supervisors.

23.2 Data Validation

23.2.1 The department supervisor or group leader will track the sample (project) flow through the laboratory from the time he has received the work folder to the time when the data is submitted for review. This will involve tracking the samples during extraction, analysis, and raw data compilation;

A. Extraction

1. The extraction for the organic section is performed under the supervision of the extraction lab manager. The extraction lab manager is responsible for reviewing and validating the integrity of sample extraction process. The extraction lab manager must review the work of the extraction technicians for completeness and for compliance to the required protocols.

2. Digestion of samples for metals analysis are performed under the supervision of the metals department supervisor. All aspects of the process are reviewed by the sample preparation technician and the metals department supervisor.

B. Analysis

1. It is first the responsibility of each individual analyst to check his/her data for errors. Raw data entries and calculations must be double checked prior to submission to the department supervisor or group leader.

2. The department supervisor will assign the work of the department to the individual analyst; will explain the QC requirements of the sample analysis protocol; will review the data to see that these requirements are met. The department supervisor must review the data prior to submitting the data to the Data Review department. This will involve a review of the calculations and the calibration integrity of the data submitted. The department supervisor will oversee the sample analysis procedure and will aide the analyst, when necessary, with the analysis of the samples. The department supervisor must also review the technicians logbooks.

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B. Analysis - cont'd.

3. If the sample does not meet the integrity requirements of the method, the department supervisor must inform the Organic and/or Inorganic Laboratory Manager. This shall be documented by specifically stating the QA/QC deficiency, sample identification number, laboratory identification number and analytical methodology. This information shall be listed on NEI's "Information Request Form". Managers or customer Service shall notify the client of the analytical problems encountered and possible corrective action (s). A copy of the information request and a copy of the telephone record log shall be filed with the folder containing the original documents necessary for data compilation. the client shall also be informed of any item that may effect any past data previously submitted.

4. Once the non-conforming item has been determined, review is performed to determine the effect of sample results. Laboratory supervisors must correct the non-conformity and document the appropriate corrective action and the cause of the problem in the Instrument Maintenance logbook.

5. Any corrected item (analytical) must be confirmed by demonstration of a conforming item. Only, once the item has been corrected will the additional work be performed.

6. For method blanks not meeting the appropriate analytical requirements, the source of the problem must be investigated. Samples analyzed under a non-compliant method blank shall be reanalyzed; or the blank reanalyzed and system inspected for malfunction. Not until a method blank passes the stipulated requirements shall sample analysis continue.

7. After the appropriate non-conforming item has demonstrated to be within the control of the laboratory and the item rectified, documentation in the appropriate logbook is required. The "Client Question Logbook" located in Data Review, documents any changes made to the final data package, the date the changes have been made and the resubmitted data sent to the client.

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C. Raw Data Compilation

The raw data is photocopied by the technician and submitted with the results of the department supervisor. The assembly of the raw data for submission to the data entry department is the responsibility of the department supervisor.

23.2.2 Data Review/Data Entry

The final report is compiled in the Data Entry/Review department under the supervision of the Data Review Report Production Manager. The raw data submitted, along with the sample Chain of Custody, the Internal Chain of Custody documents, the analyst's worksheets and copies of the Extraction Logbook data are reviewed.

Data Validation:

Laboratory Data Validation/Laboratory Self Inspection System

- 23.2.3 Each analyst is the primary person responsible for the review of the data generated at NEI. Upon completion of a case, the analysts presents the results to the Group Leader/Supervisor of the department. The case is then submitted to the Data Review Department for a complete review of the project. This review includes QC checks, client work orders, verification calculations and assembly of the final data package.
- 23.2.4 The QC Department is responsible for gathering statistics relating to precision and accuracy. Data on duplicates, matrix spikes, and matrix spike duplicates are tabulated, graphed, and subjected to statistical calculations.
- 23.2.5 In-house NON-CLP QC limits are generated on a yearly basis for all parameters. These limits are provided in the QC section of non-CLP data packages and are used to evaluate systematic errors.
- 23.2.6. All computer diskette deliverables are printed using the DOS "File Print" command. The Data Review Department is responsible to verify that the diskette is in agreement with the hard copy deliverable.

- 23.2.6 It is the responsibility of the Department Supervisors and the Data Review Department to review the overall project data before submission to the client. this review includes:
- a. A review of the field and laboratory QC data. Matrix spikes, matrix spike duplicates, duplicates, trip blanks, and field blanks are reviewed for compliance to the QC protocols. When they do not meet the required precision or accuracy, the client is notified.
 - b. Review of the supporting documentation. This includes a review of the chain of custody documents (external and internal), the field sampling documentation, the extraction log data, and the telephone logs associates with this project.
 - c. A careful review of the data for transcription errors and breaks in protocol.

Data Reporting:

- 23.2.7 The responsibility of reporting the data generated by the laboratories is that of the Data Review/Report Production Manager.
- 23.2.8 The procedures described below ensures that all documents including sample tags, traffic reports, sample tracking records, logbook pages, chromatographic/strip charts, computer printouts, raw data summaries, screening data, GC/MS confirmation data, hard copy mass spectral data correspondence and any other written documents having reference to the project are compiled in one location for submission to client.
- 23.2.9 Color coded work folders for a particular order are initiated by the sample custodian.

The following scheme is maintained for each case:

White:

Master sample tracing computer log in form, copies of traffic reports, special instructions and analytical requirements.

- a. This folder is maintained in the file cabinet in the Data Review Department.

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- b. This folder is alphabetically filed by client name and a report progress check off sheet is stapled to the front.

Pink:

All original documents pertaining to a particular case including sample tags (maintained in a plastic bag), traffic reports packing lists, chain of custody, airbills, etc.

- a. After the original traffic reports are submitted to the client, the folder is filed with the white folder.
- b. Copies of the traffic reports are maintained.

Blue:

Copies of document contained in the white folder above for distribution to the Organic Laboratory Manager.

- a. The Organic Laboratory Manager distributes copies to the involved departments: Extraction, GC, GC/MS Volatiles and /or GC/MS Semivolatiles.
- b. The blue folder is then filed in data review with the Data Review Manager.

Yellow:

Copies of documents contained in the white folder above for distribution to the Metals Laboratory.

Purple:

Copies of documents contained in the white folder above for distribution to the Wet Chemistry Laboratory.

12.2.10 Report Preparation and Data Entry

Upon receipt of the raw data from any analytical fraction, the Data Review Specialist shall:

- a. Retrieve the white (and the corresponding pink) work folders from the alphabetized file cabinet in the Data Review Department.

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1. Write Narrative explaining any analytical problems encountered throughout sample handling/analysis and the corresponding action taken. Reference and include any original facsimile transmission and telephone logs.

23.2.12

- a. Photocopy the entire data package (which contains all of the original documents). The copy is now the data package that will be part of our records.
- b. The data package that contains the original documents is now ready for compilation for submittal to the client.

23.2.13

- a. Finalize review of the data packages.
- b. Sign reports.
- c. Submit the report (s) to the typing and editing department for subsequent numbering, packing and shipping of the data packages to the client.
- d. Document shipping method on the report process check off sheet.
- e. Document the data submitted.

23.2.14 Typing and Editing Personnel shall:

- a. Document the date the reports were received on the report process check off sheet.
- b. Consecutively paginate the data packages using a stamp.
- c. Report numbering will begin immediately following the Table of Contents for the Sample Data Summary Package and for the Sample Data Package.
- d. Type in the page numbers on the Table of Contents from the corresponding data sheets.

23.2.15 Packing and Shipping

- a. Upon receipt of the data packages, the typing/editing personnel shall:
 1. Package the reports to be shipped.
 2. Ensure that custody seals are present.

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3. Ensure that the shipping method utilized is as dictated by the report process check off sheet.
4. Document on the report process check off sheet and the typing and editing log, the date the packages are mailed.
5. Document on the report process check off sheet the next consecutive data box for any duplicate data already submitted to the client. Also document which data box the duplicate data is stored in the typing and editing log.
6. File the duplicate data (in the white folder) in the data box.
7. Store the Data Box in the warehouse.
8. Ensure that a copy of the data packages are maintained by the laboratory.

File the copy by Nytest login number in the file cabinets in the warehouse with the original report process check off sheet.

Data Storage:

- a. All records associated with the sample handling and analysis are retained by the laboratory. This includes computer printouts, magnetic tapes, strip chart recordings, technician logbooks, chain of custody documents, telephone logs, and internal memos.
- b. Copies of the final report and original documentation are stored in an on-site warehouse.
- c. Records are maintained for at least three years or as specified in contractual documents.
- d. Records are maintained in numbered storage boxes. An index is maintained in the Typing and Editing office. Reports are retrieved and filed by the workers of that office.
- e. Electronic data are maintained in the laboratories for a period of time in secure cabinets designed for this purpose.

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23.3 Data Management and Handling

23.3.1 Procedures for controlling and estimating data entry errors.

- a. Minimize as much as possible human intervention. This is done by purchasing software (Finnigan Form Master, latest revision) that can transfer results directly from analytical instruments to the computer generating the hard copy report.
- b. Improve automated error detection in different stages by purchasing software (CCS) to verify results.

23.3.2 Procedures for reviewing changes to data and deliverables and ensuring traceability of updates:

- a. Initially the analyst performs review and changes are documented with date/time.
- b. The second review is by the Group Leader/Department Supervisor who performs a review is by the Group Leader/Department Supervisor who performs a review and changes are documented with date/time.
- c. The Data Review Department performs review/validation and changes are documented with date and signatures.

23.4 Record Retention

Copies of any issued report, raw data, magnetic tapes, any other records pertaining to the project will be stored for minimum of three years for projects requiring NY STATE Certification and five years for any other project. Should client require data to be stored longer, a formal request in writing is necessary. Data can also be returned upon request.

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APPENDIX II

**RUST STANDARD OPERATING PROCEDURES
FOR FIELD MEASUREMENTS**

APPENDIX II

TABLE OF CONTENTS

SOP-FM-1	Standard Operating Procedure for the Measurement of Temperature in Water
SOP-FM-2	Standard Operating Procedure for the Measurement of pH in Water
SOP-FM-3	Standard Operating Procedure for the Measurement of Conductivity in Water
SOP-FM-4	Standard Operating Procedure for the Measurement of Dissolved Oxygen in Water
SOP-FM-5	Standard Operating Procedure for the Measurement of Beta and Gamma Radiation

1.0 Title: Standard Operating Procedure for the Measurement of Temperature in Water

2.0 Location

This SOP may be used anywhere on or off the Skinner site as long as the requirements of the SOP are met.

3.0 Purpose

This SOP will be used to measure the temperature of effluent, groundwater, and surface water samples.

4.0 Scope

This SOP describes the calibration check and use of an alcohol, bimetallic, or electronic thermometer to measure the temperature of effluent, groundwater, and surface water samples. A thermometer which is properly calibrated may also be used to indicate ambient temperature.

5.0 References

1. Waste Management, Inc. Manual for Groundwater Sampling

6.0 Sample Handling and Preservation

Temperature measurements must be made in-situ, or as soon as possible after a portion of the sample is transferred to a beaker, to avoid temperature changes due to environmental factors.

7.0 Apparatus and Materials

1. alcohol, bimetallic, or electronic thermometer with a range of at least 0 °C to 100°C, with at least 0.1°C intervals
2. ice bath
3. boiling water bath
4. small (100-200 ml) beakers
5. Chemwipes or equivalent

8.0 Analytical Procedures

- 8.1 Ensure that the thermometer calibration has been checked within 30 days of use. If not, suspend the sensing probe of the thermometer directly into an ice bath which has been equilibrating for at least 5 minutes. If the thermometer reads $0 \pm 1^\circ\text{C}$, record 0.0°C . If the calibration check was satisfactory, complete the calibration check by signing and dating the record.
- 8.2 Suspend the sensing probe directly into the sample, or into a portion of the sample which has been collected in a small beaker. Ensure that the probe does not contact anything other than the sample medium.
- 8.3 Allow the thermometer to stabilize, and then record the temperature.
- 8.4 Remove the thermometer and wipe dry.

9.0 Quality Control

Calibration data should be maintained and available for reference or inspection.

10.0 Data Analysis

Since the thermometer is a direct-reading instrument, the data is recorded directly.

11.0 Documentation

Record all measurement values.

1.0 Title: Standard Operating Procedure for the Measurement of pH in Water**2.0 Location**

This SOP may be used anywhere on or off the Skinner Landfill Site as long as the requirements of the SOP are met.

3.0 Purpose

This SOP will be used to measure pH of effluent, groundwater, and surface water samples.

4.0 Scope

This SOP describes the use of a portable, temperature compensating pH/conductivity meter for field use. The instrument is calibrated using commercially available buffer reference solutions at or near 25°C, and the instrument reading is adjusted to equal the pH of the standard at 25°C.

5.0 References

1. "Test Methods of Evaluating Solid Wastes". Third Edition (1986). SW-846, Procedure 9040.
2. Cole Parmer Model DspH-3 Operating Instructions.

6.0 Sample Handling and Preservation

This procedure can be used to measure the pH of the water samples in-situ or in a beaker which has been triple-rinsed with distilled water and at least once with sample. If the measurement is to be made at some later time, the sample must be placed in a laboratory supplied bottle, filled to overflowing, and capped immediately to avoid dissolution of atmospheric gases. In such cases, the sample should be stored at 4 °C and analyzed within 24 hours.

Standard pH buffers should be stored below 30° C to minimize the likelihood of error due to evaporation or microbial growth. The standard should be discarded if the expiration date is past, or if color, turbidity, or visible microbial growth develops.

7.0 Apparatus and Materials

1. Cole Parmer pH/Conductivity meter (DspH-3) or equivalent
 2. pH 4, 7, and 10 buffer solutions
 3. Distilled water
 4. Small screw driver
 5. Beakers (100 ml or larger)
- 6.0 Bottle labeled "waste pH buffer solution"

8.0 Analytical Procedure

1. Slide back the electrode compartment to release pH and conductivity electrodes.
2. Deploy electrodes in either the 90 or 180 degree measurement position.
3. Remove the bottom section of the protective pH probe cap.
4. Thoroughly rinse the pH probe and remaining parts of the probe cap with distilled water.
5. Energize the instrument by depressing the on/off switch once. (Ensure the instrument is in the pH mode by pressing the pH/PPM microswitch as needed).
6. Slide back the bottom compartment cover to the first stop, exposing the adjustment pots.
7. Transfer enough pH-7 buffer solution to cover at least $\frac{1}{2}$ of the pH probe into a beaker that has been either triple-rinsed with distilled water and once with the same buffer solution, or a disposable beaker that has been rinsed once with the buffer solution. Measure the buffer temperature and record. Using the attached Table, record the corresponding temperature-adjusted pH value.
8. Immerse the sensing portion of the probe at least $\frac{1}{2}$ its length into the buffer solution. Allow the reading to stabilize while slightly agitating the solution.
9. Adjust the CAL pot until the instrument indicated the correct temperature-compensated pH value.
10. Remove the probe from the test solution and rinse with distilled water.
11. Discard the used pH buffer into the collection bottle for subsequent disposal.
12. Select the appropriate pH4 or pH10 buffer solution (choice of buffers should be such that this buffer and the pH 7.0 buffer bracket the sample pH).
13. Immerse the sensing portion of the probe at least $\frac{1}{2}$ its length into the buffer solution. Allow the reading to stabilize while slightly agitating the solution.
14. Adjust the SLOPE pot until the instrument indicates the correct temperature-compensated pH value.
15. Remove the probe from the test solution and rinse with distilled water.
16. Discard the used pH buffer into the collection bottle for subsequent disposal.
17. Immerse the sensing portion of the probe at least $\frac{1}{2}$ its length into the sample. (This measurement can be made in-situ, or a portion of the sample can be transferred into a beaker that has been triple-rinsed with distilled water and once with the sample solution). Allow the reading to stabilize while slightly agitating the solution.
18. Read the sample pH and record. (NOTE: If the sample pH is outside the range of the calibration standards, repeat the instrument calibration using the correct buffer solution prior to remeasuring the sample pH. Remove the probe from the sample and rinse thoroughly with distilled water before repeating the instrument calibration).
19. Remove the probe from the sample and rinse thoroughly with distilled water.
20. Measure and record the sample temperature.

21. If no further measurements are being made, de-energize the instrument, and replace to the protective pH probe cap filled with fresh pH 4 buffer or deionized water.

9.0 Quality Control

Calibration data should be maintained and available for reference or inspection. Recalibrate the instrument per project requirements. Duplicate samples should be measured per project requirements.

10.0 Data Analysis

Since this meter is a direct-reading instrument, the data is recorded directly.

11.0 Documentation

Record all measurement values.

Temperature Adjusted Buffer pH Values Table

<u>Temp (°C)</u>	<u>pH 4 Buffer*</u>	<u>pH 7 Buffer*</u>	<u>pH 10 Buffer**</u>
0	4.01	7.12	
1		7.11	
2		7.11	
3		7.10	
4	4.01	7.10	
5		7.09	
6		7.08	
7		7.08	
8		7.07	
9		7.07	
10	4.00	7.06	10.15
11		7.06	10.14
12		7.05	10.13
13		7.05	10.12
14		7.04	10.11
15	4.00	7.04	10.10
16		7.04	10.09
17		7.03	10.08
18		7.03	10.07
19		7.02	10.06
20	4.00	7.02	10.05
21		7.02	10.04
22		7.01	10.03
23		7.01	10.02
24		7.00	10.01
25	4.01	7.00	10.00
26			9.99
27			9.98
28			9.97
29			9.97
30	4.01		9.96

*Cole Parmer Instruments

**VWR Scientific

1.0 Title: Standard Operating Procedure for the Measurement of Conductivity in Water**2.0 Location**

This SOP may be used anywhere on or off the Skinner site as long as the requirements of the SOP are met.

3.0 Purpose

This SOP will be used to measure conductivity of effluent, groundwater, and surface water samples. This SOP is not applicable to solid samples.

4.0 Scope

This SOP describes the use of a portable, temperature-compensating pH/conductivity meter for field use. The instrument is calibrated using a commercially available KCL reference solution at or near 25°C, and the instrument reading is adjusted to be equal to the conductivity of the standard (at 25°C). A zero-conductivity adjustment is also made.

Because field measurements may be made at temperatures other than 25°C, and the temperature coefficient of the internal compensator may be different than the sample being measured, the temperature of the water sample shall be measured and recorded as well as the conductivity.

5.0 References

1. "YSI Conductivity Calibrator Solutions Instructions," YSI Inc., Yellow Springs, Ohio.
2. "Standard Methods for the Examination of Water and Wastewater," 17th Edition (1989), Method 205.
3. "Test Methods for Evaluating Solid Waste," Third Edition (1986), SW-846, Procedure 9050.

6.0 Sample Handling and Preservation

This procedure can be used to measure the conductivity of water samples in-situ or in a beaker which has been triple-rinsed with distilled water and at least once with sample water. If the measurement is to be made at some later time, the sample must be placed in a pre-cleaned laboratory bottle, filled to overflowing, and capped immediately to avoid dissolution of atmospheric gases. In such cases, the samples should be stored at 4°C and analyzed within 24 hours.

Conductivity standards should be stored below 30°C to minimize the likelihood of error due to evaporation or to microbial growth. The standard should be discarded if the expiration date is past, or if color, turbidity, or visible microbial growth develops.

7.0 Apparatus and Materials

1. Cole Parmer pH/Conductivity meter (DspH-3) or equivalent
2. Conductivity standards
3. Small screw driver
4. Chemwipes or equivalent

5. Beakers (100 ml or larger)
6. Laboratory supplied sample jars with labels and seals

8.0 Analytical Procedure

1. Slide back the electrode compartment to release pH and conductivity electrodes.
2. Deploy electrodes in either the 90 or 180 degree measurement position.
3. Remove the protective cap.
4. Rinse the conductivity probe thoroughly with distilled water.
5. Pat dry the probe with a chemwipe.
6. Energize the instrument by depressing the on/off switch once. (Ensure the instrument is in the conductivity mode.) For each range change desired, depress the pH/PPM microswitch once. The YSI unit utilizes 3 ranges for conductivity. The range sequence is pH-200K-20K-2K. In most cases the 2K range will be used. Only the 200K range uses the X10 enunciator.
7. Slide back the bottom compartment cover to the first stop, exposing the adjustment pots.
8. The dried probe should read 0 in air; if not, adjust the ZERO pot until the instrument reads 0. If the conductivity meter cannot zero, it may indicate dried solids on the sensor. If so, clean the probe with a mild detergent solution, thoroughly rinse with distilled water, let the probe air-dry, and repeat this step.
9. Immerse the probe in a solution of known conductivity (normally 1000 \pm 0.5% umhos/cm), and record the value. Also measure and record the temperature of the conductivity standard.
10. Adjust the SPAN pot until the instrument indicates the conductivity value of the known solution.
11. Remove the probe from the test solution and thoroughly rinse with distilled water and pat the probe dry.
12. Rinse the probe with the sample by placing the probe into a beaker containing an aliquot of the sample and dip in and out several times. Then, place the probe into another aliquot of the sample.
13. Read the sample conductivity. If the value exceeds the value of the calibration standard by more than a factor of 10, repeat the instrument calibration using a standard conductivity solution in the same range as the sample, then repeat Steps 12 through 13. Also measure the sample temperature to the nearest $^{\circ}\text{C}$.
14. Record the measured conductivity reading and sample temperature.
15. Rinse the probe thoroughly with distilled water.
16. If no further measurements are being made, de-energize the instrument, remove the probe and replace the protective cap.

9.0 Quality Control

This procedure is specifically designed for survey-type field measurements, and is not capable of generating results of high precision or accuracy. If results of higher quality are desired, measurements must be made at $25 \pm 0.1^{\circ}\text{C}$ using a calibrated conductivity meter-cell combination. Method 9050 of SW-846 is appropriate for those cases.

Calibration data should be maintained and available for reference or inspection. Recalibrate the instrument per project requirements. Duplicate samples should be measured per project requirements.

10.0 Data Analysis

Since this meter is a direct-reading instrument, the data is recorded directly.

11.0 Documentation

Record all measurement values.

1.0 Title: Standard Operating Procedure for the Measurement of Dissolved Oxygen in Water

2.0 Location

This SOP may be used anywhere on or off the Skinner site as long as the requirements of the SOP are met.

3.0 Purpose

This SOP will be used to measure the dissolved oxygen content of surface water samples.

4.0 Scope

This SOP describes the calibration and use of an electronic meter to measure the dissolved oxygen of surface water and other aqueous samples.

5.0 References

YSI Dissolved Oxygen Meter Operators Manual

6.0 Sample Handling and Preservation

Dissolved Oxygen measurements must be made in-situ, or as soon as possible after a portion of the sample is transferred to a beaker. Dissolved oxygen measurements should be made within 5 minutes of sample collection to avoid changes in the dissolved oxygen content of the sample due to changes in the environmental factors (i.e., temperature, CO₂ content, pressure, etc.).

7.0 Apparatus and Materials

1. YSI Dissolved Oxygen Meter
2. Small (100-200 ml) beakers
3. Chemwipes or equivalent

8.0 Analytical Procedure

Check calibration of dissolved oxygen meter per project requirements using the following procedures:

1. Turn unit on.
2. Place dissolved oxygen probe in distilled water.
3. Record the temperature of the water and air pressure.
4. Calibrate the meter to the percent oxygen saturation based on the temperature and pressure measurements.
5. Zero the meter.
6. Place the dissolved oxygen probe in the water, bubble air through the water for 5 minutes, and record the dissolved oxygen content using the procedures described below.

7. Compare the accuracy of the dissolved oxygen measurement to the measurement last recorded. If the measurement is greater than $\pm 10\%$ repeat the measurement. If the measurement is still greater than $\pm 10\%$ replace unit with another meter.

8.2 Sample Measurement Procedures

1. Turn the meter on.
2. Record air temperature and pressure.
3. Calibrate the meter to the percent oxygen saturation based on the temperature and pressure measurements.
4. Zero the meter.
5. Submerge the probe in the liquid sample.
6. Wait for the dissolved oxygen measurements to stabilize and then record the measurement.

9.0 Quality Control

The calibration check data should be maintained and made available for reference or inspection.

Duplicate measurements will be collected every 10 samples or fewer. If the duplicate measurement is greater than $\pm 20\%$, recheck the calibration of the meter. If the meter measurement is greater than $\pm 20\%$ of the last calibration check measurement, replace the unit and remeasure all samples (if possible) since the last duplicate measurement.

10.0 Data Analysis

Since the meter is a direct-reading instrument, the data is recorded directly.

11.0 Documentation

Record all measurement values.

1.0 Title: Standard Operating Procedure for the Measurement of Beta and Gamma Radiation

2.0 Location

This SOP may be used anywhere on or off the Skinner site as long as the requirements of the SOP are met.

3.0 Purpose

The purpose of this SOP is to provide general reference information on the use of the Victoreen Survey and Count Rate Meter Model 190 used with the pancake GM (Geiger-Mueller) beta/gamma frisker for screening samples for beta and gamma radiation.

4.0 Scope

This procedure applies to field-screening soil and water for beta and gamma radiation.

5.0 References

5.1 Operating Manual for the Victoreen, Model 190 Survey and Count Rate Meter, Victoreen, Inc., Cleveland, Ohio.

5.2 A Compendium of Superfund Field Operations Methods, U.S. EPA, Office of Emergency and Remedial Response, Washington DC, EPA/600/P-87/001, 1987.

6.0 Definitions

Roentgen - The amount of gamma or X-radiation that will produce one electrostatic unit of charge in 1 cubic centimeter of dry air (R). Also reported as Milliroentgens (mR), or Microroentgens (uR).

7.0 Apparatus and Materials

1. Victoreen Model 190 Survey and Count Rate Meter.
2. Victoreen "Pancake" GM Probe Model RP-1.
3. Four 9 volt alkaline batteries
4. Field logbook.

8.0 Procedures

8.1 General

All radiation detectors other than radiation badges operate on the principle that radiation causes ionization in the detection media. The ions produced are counted electronically, and relationship is established between the number of ionizing events and the quantity of radiation present.

The Victoreen Model 190 can display the readings in counts/min, counts/sec, mR/H or Bq/cm² depending on the mode selected and the enablement of the mode during factory calibration.

Improper survey technique or improper use of the instrument could result in erroneous data which could be detrimental to providing adequate personnel protection.

8.2 Operating Instructions

Install the batteries in accordance with the manufacturer's instructions.

Install the probe holder kit, the probe and the adaptor as outlined in the manufacturer's instructions.

8.2.1 Perform an Operational Check

Turn the instrument on by pressing the ON/OFF button on the front panel.

Check that the instrument calibration is valid. (Calibration is valid for 6 months.) If the calibration tag is past due, tag the instrument - "defective - do not use", record name, date, and reason for the tag, and return to supplier for calibration.

Observe the following:

- a. All segments of the display should come on for approx. 1 second.
- b. The display will blank and display the version number of the software in the alphanumeric display.
- c. The unit will read and display internal and external information, and then display the Probe Model Number and Serial Number, or a portion of it.
- d. The instrument will begin to operate in the selected mode.

NOTE: Check the operating manual if any of the above fail to occur or if an error message is displayed.

Test each button of the instrument as follows:

- a. Push the LIGHT button of the instrument to cause the display backlight to come on.
- b. Press the MODE button to toggle the available display modes (counts per minute, CPM/counts per second, CPS).
- c. Press the RATE/INTEG button to toggle the alphanumeric display between the Rate Mode and the Integrate Mode.
- d. Press the RESP TIME button to toggle the available response time selections. The new selection is displayed in the alphanumeric display as follows:

RESPONSE is XX s

Where XX is the current active first scale response time (24, 12, 6, or 3 seconds).

NOTE: If the Instrument is in the Integrate Mode, press and hold the RESP TIME button for three seconds. The integrate value should reset to zero without changing the response time.

- f. Press the AUDIO button to toggle on or off the click from the speaker associated with each count from the detector. The clicks from the speaker have a one to one correspondence with counts from the detector up to 3200 cpm. For counts above 3200 cpm, there is a transition from clicks to a steady tone.
- g. Press the ON/OFF button to turn the instrument off.

A LOW BATTERY message will be displayed and an audio signal will sound before the battery energy is exhausted. The amount of time remaining varies, however, depending on the previous use of the instrument.

The probe adaptor module carries the calibration data for the instrument. It will be calibrated at the factory prior to shipment if the unit is shipped with the probe. The instrument itself does not require calibration.

NOTE: It is important to read, in entirety, the applicable operating manual for the instrument prior to implementation of field-screening.

8.2.2 Perform a Background Check

After enabling the unit, place detector face-up. Allow the count rate to stabilize. Note the background count rate.

If the background count rate is high (>300 cpm for material frisking), then the background check is unsatisfactory.

Record the rate-meter reading in the field notebook.

8.2.3 Perform a Response Check

Field response checks will be made of equipment prior to use. Included in these checks are limited functional tests to insure proper operation of the electronics. A Coleman mantle or other such known emitting source may be used for this test. If no response cannot be elicited, return the equipment to the supplier for repair.

8.2.4 Operational Use

- o Scan the area at approximately 2 to 5 cm/sec (1 to 2 inches/sec).
- o Keep the detector face within 1 to 2 cm ($\frac{1}{2}$ ") of the surface of the sample. A tissue may be used over the probe face to keep soil particles from entering the probe. With a tissue in place, the probe may be set directly on the sample.
- o If surface activity is detected (indicated by speaker response), keep the detector stationary over the area of contamination.
- o Scan each sample for approximately 2 minutes, and record the stabilized count-rate in the field logbook.
- o If the count-rate is 2 times background or more, notify the Health and Safety Officer immediately.

9.0 Attachments

- 9.1 Operating Manual for Victoreen Model 190, select pages.

10.0 Documentation

Record all measurement values.

III

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APPENDIX III

SKINNER LANDFILL EFFLUENT DISCHARGE REQUIREMENTS

Effluent parameters for discharge to the sanitary sewer have not yet been established by the Butler County Department of Environmental Services (BCDES). When BCDES does issue an authorization to discharge, the discharge requirements will be inserted into this Appendix.

APPENDIX IV

NEI STANDARD OPERATING PROCEDURES FOR BOD,
AMMONIA, TDS, TSS AND OILS AND GREASE



TOTAL ANALYTICAL SERVICES FOR A SAFE ENVIRONMENT

nytest environmental inc.

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STANDARD OPERATING PROCEDURE

FOR DETERMINATION OF

BIOCHEMICAL OXYGEN DEMAND (BOD)

WRITTEN BY:

Buddadheb Nath

Buddadheb Nath,
Wet Chemistry Supervisor

DATE:

10/13/94

APPROVED BY:

Remo Gigante

Remo Gigante,
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DATE:

11/4/94

Steve Wesson

Steve Wesson,
Laboratory Operations Manager

DATE:

11-15-94

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1.0 SCOPE AND APPLICATION

The purpose of this document is to provide operational procedures to analyze for Biological Oxygen Demand in the municipal and industrial wastewaters, surface waters and monitoring wells.

2.0 SUMMARY OF METHOD

The sample is incubated for 5 days at 20°C in the dark. The reduction in dissolved oxygen concentration during the incubation period yields a measure of the biochemical oxygen demand.

For 20 day BOD and Carbonaceous BOD, the sample is incubated 20 days and 5 days respectively, with the exception of C-BOD which is incubated with a nitrification inhibitor.

3.0 SAFETY ISSUES

The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined. However, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. NEI maintains a current awareness file of Occupational Safety and Health Administration (OSHA) regulations regarding the safe handling of the chemicals specified in this method. A reference file of Material Safety Data Sheets (MSDS) is also available to all personnel involved in chemical analyses.

4.0 SAMPLE HANDLING

Holding Time: 48 hours from collection
NYS ASP : 24 hours from VTSR
Preservation: Refrigerate at 4°C.
Container : Plastic or glass

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5.0 APPARATUS

- 5.1 Incubation bottle, 300 ml.
- 5.2 Air incubator (Fisher) or equivalent
- 5.3 YSI Model 59 DO Meter (or Orion ion analyzer #720 with O₂ probe #97-08-00) or equivalent
- 5.4 Computer system with BODA software attached with YSI model 59 DO meter or equivalent
- 5.5 20 liter water reservoir
- 5.6 HACH residual chlorine kit with DPD pillows or equivalent
- 5.7 BOD polyseed pillows (form Polybac) or equivalent
- 5.8 Repeater pipetor

6.0 REAGENTS

- 6.1 Phosphate buffer solution: Dissolve 8.5g KH₂PO₄, 21.75g K₂HPO₄, 33.4g Na₂HPO₄, 7H₂O and 1.7g NH₄Cl in about 500 ml distilled water and dilute to 1 liter. The pH should be 7.2 without further adjustment.
- 6.2 Magnesium sulfate solution: Dissolve 22.5g MgSO₄-7H₂O in distilled water and dilute to 1 liter.
- 6.3 Calcium chloride solution: Dissolve 27.5g anhydrous CaCl₂ in distilled water and dilute to 1 liter.
- 6.4 Ferric chloride solution: Dissolve 0.25g FeCl₃-6H₂O in distilled water and dilute to 1 liter.
- 6.5 Sodium sulfite solution, 0.025N: Dissolve 1.57g Na₂SO₃ in 1 liter distilled water. Prepare daily.
- 6.6 Glucose glutamic acid solution (GGA): Add 150mg glucose and 150mg glutamic acid (pre-dried at 103°C. for 1 hour) to distilled water and dilute to 1 liter. Prepare just prior to use. Should be made bi-weekly.
- 6.7 NaOH solutions, 1(N): Add 40gms of NaOH pellets in 1000ml DI water.
- 6.8 HCl acid solution, 1(N): Add 50ml of HCl acid in 500ml DI water and dilute to 1000ml with DI water.

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6.0 REAGENTS - continued

- 6.9 Manganese sulfate solution: Dissolve 364gm of Mn_2SO_4 in 1000ml DI water.
- 6.10 Sodium Thiosulfate solution {0.025(N)}: See SOP #800.
- 6.11 Starch solution: Prepare an emulsion of 10gm starch in a mortar with small amount of DI water. Add this emulsion in 1000ml boiling DI water and let it boil a few more minutes. Remove the water and let settle overnight. Transfer the clear supernate solution in a 1 liter bottle and add 4g sodium propionate and 2g of sodium azide as preservative.
- 6.12 Alkaline Iodide Azide solution: Commercial grade (from HACH/FISHER Scientific).
- 6.13 Concentrate sulfuric acid
Note: Every reagent must have prepat and initial of technician.

7.0 PREPARATION OF DILUTION WATER

- 7.1 Sufficient DI water is aerated for one hour at room temperature. Leave the water after mixing well for 24 hours to stabilize the water temperature and DO.
- 7.2 Add 1ml of phosphate buffer, 1ml of $MgSO_4$, 1ml of $CaCl_2$, and 1ml of $FeCl_3$ solutions for every 1 liter of water. Mix well. Check the DO by winkler method.
- 7.3 Transfer 250ml of this dilution water to a 500ml beaker and add contents of 1 polyseed capsule. This seeded solution is aerated for 30 minutes.

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8.0 SAMPLE PREPARATION

8.1 Check the sample color, odor, pH and total residual chlorine using HACH kit.

Table I

Source	Color	Clarity	Odor	% (dilutions)
Influent or Effluent	No	Clear	No	3, 10, 15
Influent or Effluent	Yes	Clear	No	0.3, 3, 10
Influent or Effluent	Yes	Turbid	Yes	0.03, 0.3, 3
Sewage	Yes	Turbid	Yes	0.03, 0.3, 3
Monitoring Well	No	Clear	No	3, 15, 67
Surface	Yes	Turbid	No	3, 10, 25
Stream Water	Yes	Turbid	Yes	0.3, 3, 15

For prussion blue colored samples, samples with rotten egg smell, etc. should be handled carefully.

- 8.2 If pH of the sample is not within 6 to 8, take an aliquot of 300ml sample and adjust pH using NaOH or HCl solutions.
- 8.3 Samples with chlorine should be treated with appropriate amount of Na_2SO_3 solution based on the concentration of residual chlorine.
- 8.4 Switch on YSI Model 59 BOD meter and the stirrer of the probe.
- 8.5 Using the history, clarity, color, odor and source of each sample and/or using Table I list at least three dilutions should be seeded.
- 8.6 Using disposable pipets, transfer 3 times of the dilution of each sample (after pretreatment as in Step 2 & 3) to three BOD bottles.

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8.0 SAMPLE PREPARATION - continued

8.7 Set the bottles in the following order:

Blank(s): Dilution water only
Seed : Dilution water with seed
GGA : Dilution water with 5ml of GGA solution

Samples 1 to 10 may include duplicate & spike

GGA
Blank
Samples 11 to 20 may include duplicate & spike

GGA
Blank, etc.

To Spike: Add 5ml of GGA solution to 3 extra BOD bottles with 3 different dilutions as in step 8.6.

Note: There should be one set of duplicates and one set of spikes for every twenty analytical samples.

8.8 Using repeater pipetor add 2.5ml of seed solution (as in step 7.3) to each bottle except the blank(s) samples.

8.9 For Carbonaceous BOD, add 3mg of 2-chloro-6-(trichloromethyl) Pyridine to each BOD bottle for this C-BOD. Always set up an extra st of blank and standard bottles.

8.10 Siphon the dilution water into the BOD bottles containing sample and seeded solution carefully to prevent effervescence.

8.11 Calibrate the probe using method(s) described in the SOP #912 for DO.

9.0 Procedure

9.1 Switch on the computer and start BODA program. From the pull-down menu, go to the "add sample" menu and start filling up the sample information along with dilution data, seed information, and any other QC data.

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- 9.2 Next go to the "Initial DO" taking menu and choose to start a new batch. Add samples and QC samples as described in Step 8.7.
- 9.3 Then press F2 to go to bench screen and ultimately to the Model 59 screen.
- 9.4 Switch the BOD meter control to the external control. Using the bar code reader, read the sample bottle ID and follow the instructions for initial DO reading.
- 9.5 As the bottles are read, they should be stoppered and capped. There should be some excess water for water seal capping or the overflow collar.
- 9.6 At the end of the run, transfer all bottles in the incubator (at 20°C.) for incubation for 5 days.
- 9.7 Switch off the computer and DO meter.
- 9.8 After 5 days incubation, repeat the steps 8.10 to 8.14 except in place of taking "initial DO" take the "Final DO".

Note: For 20 day BOD, follow the same steps 8.11 - 9.4, except in place of taking "initial DO, take the 'Final DO' after 20 days"
Note: For carbonaceous BOD (C-BOD), follow the same procedures as in 5 day BOD.
- 9.9 Once all the final DO's are taken, throw out the contents of the bottles and clean the bottles using hot water and soap by the glassware washer.
- 9.10 From the computer get the printout for all results and DOs.

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10.0 CALCULATIONS

10.1 BOD Result:

$$\text{mg/L BOD} = \frac{(D_1 - D_2) - (\text{Average}\{B_1 - B_2\})f}{P}$$

where:

D_1 = DO of diluted sample
 D_2 = DO of diluted sample after incubation
 B_1 = DO of dilution blank before incubation
 B_2 = DO of dilution blank after incubation
 f = Ratio of seed in fraction of sample used
 P = Decimal fraction of sample used

For spike recovery: subtract the final DO for spiked sample of each dilution from the final DO for unspiked same sample of same dilution and calculate the BOD as above. The decimal fraction of sample should be replaced by decimal fraction of GGA added.

Hence, the % recovery = $\frac{\text{spike recovery}}{194} \times 100$

Calculation Rules:

1. Minimum final DO = > 1.0 and difference of initial and final DO depletion ≥ 2.0 .
2. If no dilution follows rule #1, then highest % sample will be used to calculate a smaller value as if 2.0 mg/L depleted.
3. If no dilution has final DO ≥ 1.0 mg/L, then lowest % sample will be used to calculate a greater value as if 1.0 mg/L DO remained.
4. Calculate the sample BOD by averaging all values that meet the above criteria. When the difference is > 25%, then consult with the department supervisor.

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11.0 REFERENCES

- 11.1 Environment Protection Agency, 1979. Methods for Chemical Analysis of water and wastes. EPA - 600/4-79-020, March 1979 (EPA Method 405.1)
- 11.2 American Public Health Association, 1989. Standard Methods for the Examination of Water and Wastewater, 17th edition, Part 5210, page 5-2 to 5-10.
- 11.3 Federal Register, 40 CFR Part 136 Jan/32/91 pgs. 4504-4515

NEI SOP No. : 911
Preparation Date : 3/16/94
Revision No. : 1
Revision Date : 8/30/94
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12.0 References

12.1 EPA Method for Chemical Analysis of Water and Wastes. EPA-600/4-79-02-0 March 1979 Revised 3/83 Method 376.1

12.2 American Public Health Association: Standard Method for the examination of water and waste water 1992 18th Edition part 5520D

12.3 Federal Register 40 CFR Part 136 Guidelines established Test Procedures for the analysis of pollution under the Clean Water Act, Technical Amendment Volume 59 no. 20, January 30, 1994

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STANDARD OPERATING PROCEDURE
NITROGEN, NITRATE - NITRITE
(COLORIMETRIC, AUTOMATED, CADMIUM REDUCTION)
IN ENVIRONMENTAL SAMPLES

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Buddhadab Nath, Wet Chemistry Supervisor

APPROVED BY: Remo Gigante 11/5/94
Remo Gigante, Acting QA/QC Director

Steve Wesson 11-15-94
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1.0 SCOPE AND APPLICATION:

This Method is applicable to surface and saline waters and domestic and industrial wastes. The applicable range is 0.01 to 4mg/L Nitrate-Nitrite Nitrogen. The range may be extended with sample dilution.

2.0 SUMMARY OF METHOD:

Nitrate is quantitatively reduced to nitrite by passage of the sample through a copperized cadmium column. The nitrite (reduced nitrate plus original nitrite) is then determined by diazotizing with sulfanilamide and coupling with N-(1-naphtyl) ethylenediamine dihydrochloride. The resulting water soluble dye has a magenta color which is read at 520nm. Nitrite alone also can be determined by removing the cadmium column.

3.0 SAFETY ISSUES:

The toxicity or carcinogenicity of each reagent is used in this method has not been precisely defined. However, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. NEI maintains a current awareness file of Occupations Safety Health Administration (OSHA) regulations regarding the safe handling of the chemicals specified in this method. A reference file of Material Safety Data Sheets (MSDS) is also available to all personnel involved in chemical analysis.

4.0 SAMPLE HANDLING:

Holding Time: 28 days from sample collection; 26 days from
VRT NYS ASP Projects
Preservation: Cool 4°C, H₂SO₄ to pH <2
Container: Plastic or glass

5.0 INTERFERENCES:

5.1 Sample turbidity and/or suspended matter may interfere and should be removed by filtration.

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5.2 Low results may be obtained for sample containing high concentrations of iron, copper, or other materials. In this method EDTA is added to buffer to reduce this interference.

5.3 Pre-extract samples containing large concentrations of oil and grease with an organic solvent to prevent coating of cadmium surface.

6.0 APPARATUS:

6.1 Technicon autoanalyzer (0.05 to 10mg/L) or

6.2 Lachat autoanalyzer (0.01 to 4.0mg/L)

7.0 REAGENTS:

7.1 15M Sodium Hydroxide:

Dissolve 150g NaOH in 250ml of distilled water. When cooled, store in a plastic bottle.

7.2 Ammonium Chloride buffer, pH = 8.5:

Dissolve 85g NH₄CL and 1.0g Disodium EDTA dihydrate in about 800ml distilled water.

7.3 Sulfanilamide color reagent:

To about 600ml distilled water, add 100ml of 85% phosphoric acid (H₃PO₄), 40.0g sulfanilamide and 1.0g N-(1-Naphthyl)-ethylene diamine dihydrochloride (NED). Dissolve and dilute to 1 liter with DI water. Store in dark bottle.

7.4 Cadmium-Copper Reduction Column:

See EPA method #353.2, 6.1 to 6.4, or Methods Manual by Lachat for preparation procedure.

7.5 Wash solution (Technicon):

Use distilled water for unpreserved samples. For samples preserved with H₂SO₄, per liter if wash solution.

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7.6 Stock nitrate standard, 2000mg N/L.

Dissolve 14.44g KNO_3 in distilled water and dilute to 1 liter. Preserve with 2ml of chloroform per liter.

7.7 Stock nitrite standard, 2000mg N/L as NO_2^- :

Dissolve 9.86g NaNO_2 in distilled water and dilute to 1 liter. Preserve with 2ml of chloroform per liter.

NOTE: Stock $\text{NO}_3^-/\text{NO}_2^-$ standard solution also can be purchased commercially up to 1000mg per liter.

7.8 Combined Nitrate-Nitrite stock standards:

Combine 100ml Nitrate as N standard with 100ml Nitrite as N in beaker, which results in 1000mg/L Nitrate-N and 500mg/L Nitrite-N. For separate analysis use single component for individual analysis.

Intermediate Stock:

Add 10ml in 100ml flask and dilute to mark with DI water.

Calibration standards:

Dilute Intermediate stock using 100ml volumetric flask in the following concentration: 4, 2, 1, 0.5, 0.2mg/L as Nitrate N and 2, 1, 0.5, 0.25, 0.1, 0.5, 0.2ml respectively.

8.0 PROCEDURES:

- 8.1 If the pH of the sample is not within the pH 5 to 9 range, adjust it to this with either conc HCL or conc NaOH.

NOTE: Due to preservative acid, the buffer is used to increase the pH to 8.5. For unpreserved sample the pH should be adjusted as above.

Also the calibration standards ICV, CCV, and LCS should be acidified with conc. sulfuric acid to pH <2.

- 8.2 Set manifold

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- 8.3 Allow both colorimeter and recorder to warm up for 30 minutes (Technicon only). Run as baseline with all the reagents, feeding distilled water thorough the sample line. Remember to assemble the cadmium column after the reagents have been fed through the system and to remove the column before the system is rinsed with distilled water at completion.
- 8.4 Set gain for Lachat at 340. Adjust zero on colorimeter to obtain a stable baseline for both analytes.
- 8.5 Place distilled water wash tubes in alternate openings on sampler (Technicon only).
- 8.6 Activate cadmium column by sampling a set of combined standards of 220ppm total nitrate concentration.
- 8.7 Place working standards in order in sampler tray. Complete filling of sampler tray with unknown samples/QC as per following sequence:

NOTE: Follow the SOP #903 for Lachat instrument and SOP #902 for Technicon auto analyzer for details.

4.0	mg/L (NO ₃)	Std	for calibration
2.0	"	"	"
1.0	"	"	"
0.5	"	"	"
0.2	"	"	"
Blank	Blank	Calibration	
ICV	Initial Calibration Verification std		
ICB	"	"	Blank
CCB	Continuous	"	0.50mg/L (NO ₃ -N)
LCS	Laboratory Control Sample (a commercial standard)		
PBW	Preparation Blank water/soil		
Sample #1	\ can be dup & spike		
Sample #6	/		
CCV			
CCB			
Sample #7	\ can be dup & spike		
Sample #14	/		
CCV			
CCB			
LCS			
PBW			

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NOTE 1: CCV and CCB should be run after every 8-10 samples and after every 18-20 samples CCV, CCB, LCS, PBW should be run. Also at the end of the tray there should be CCV, CCB, LCS, and PBW samples.

NOTE 2: Every 20 or less analytical samples must have one duplicate and one spiked sample. Spiking should be done by using 0.1ml Intermediate stock in a 10ml sample.

8.8 At the end of run follow the procedure to shutdown the system as described in the instrument handling SOP's.

9.0 CALCULATIONS:

For TAOS system follow the technicon SOP and for Lachat Quick Calc system follow the Lachat SOP.

Spike calculations:

Spike recovery (%) = $\frac{\text{spiked sample result} - \text{sample result}}{0.5} \times 100$

(for NO₃ and NO₂ individually)

10.0 QUALITY CONTROL

10.1 One Method Blank, one duplicate sample, one spike sample, one laboratory control sample per batch of 20 samples or per run if samples are less than 20.

10.2 Initial calibration Verification (ICV) and Continuous Calibration Verification recovery should be between 80 to 115% in order to continue analysis. If recoveries of ICV or CCV are outside QC limits, repeat analysis or start new calibration curve. See your Supervisor before restarting new calibration.

10.0 REFERENCES:

10.1 EPA 1979, Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-020, March 1979 (EPA method #353.2)

10.2 American Public Health Association, 1989. Standard Methods for the Examination of Water and Wastewater, 17th Edition, part 4500, pages 4-137 to 4-139.0



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Revision No. :
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STANDARD OPERATING PROCEDURE
FOR
FILTERABLE RESIDUE
IN WATER SAMPLES
TDS

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1.0 SCOPE AND APPLICATION:

This method is applicable to drinking , surface, and saline waters, domestic and industrial wastes with a range of 10mg/L to 20,000mg/L.

2.0 SUMMARY OF METHOD:

A well mixed sample is filtered through a standard glass fiber filter. This filtrate is evaporated and dried to constant weight.

3.0 SAFETY ISSUES:

The toxicity and carcinogenicity of each reagent is used in this method has not been precisely defined. However, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. Nei maintains a current awareness file of Occupations Safety Health Administration (OSHA) regulations regarding the safe handling of the chemicals specified in this method. A reference file of Material Safety Data Sheets (MSDS) is also available to all personnel involved in chemical analysis.

4.0 SAMPLE HANDLING:

4.1 Storage: Plastic or glass 250ml bottle.

4.2 Preservation: Refrigerate at 4°C.

4.3 Holding Time: 7 days. from collection day. NYSASP:
5 days from VSR.

5.0 INTERFERENCES:

5.1 High mineralized water may be hygroscopic and will require prolonged drying, desiccation and rapid weighing.

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5.2 High concentration of bicarbonates will require prolonged drying at 180°C to insure conversion to carbonates.

5.3 Total residue should be less than 200mg.

6.0 EQUIPMENT AND APPARATUS:

6.1 Glass fiber disks, 4.7cm, 2.1cm without Organic Binder Whatman, 934AH, or equivalent.

6.2 Gooch crucible adapter

6.3 Suction flask, 500ml.

6.4 Gooch crucibles, 25ml for 2.1cm

6.5 Evaporating dishes, porcelain, 100ml volume

6.6 Drying oven at 180°C, Drying oven at 105°C

6.7 Desiccator

6.8 Vacuum pump

6.9 Graduate cylinder, 100mls

6.10 Analytical Balance capable of weighing to 0.1mg

7.0 PROCEDURE:

7.1 A glass fiber filter is placed at the bottom of a Gooch crucible, the vacuum is applied and the filter is washed with three (3) successive 20ml volumes of DI. Vacuum suction is continued until all traces of DI water is removed. Filtering Gooch is stored in desiccator until used.

7.2 The evaporating vessels are cleaned and ignited at 550 ± 50°C for one (1) hour in a muffle furnace. The evaporating vessels are then cooled in a desiccator and weighed immediately.

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- 7.3 100ml of sample is used for analysis, but if a particular sample is known to have less than 10mg of dissolved solids, then 250ml of sample is used. Before the sample is filtered, the filter is washed with three (3) successive 10ml of DI water and allowed to continue suction for three (3) minutes after filtration is completed.
- 7.4 The filtrates are transferred to the weighed evaporation vessels and are evaporated to dryness in a 103-105°C oven, then drying is continued at 180°C + 2 in an oven for one hour.
- 7.5 The evaporating vessels are then cooled in a desiccator and weighed. The drying cycle is repeated until a constant weight is obtained 4% of previous weight or 0.5mg, or whichever is less.

8.0 CALCULATIONS:

(total filterable residue in mg/L at 180°C)

$$\text{TDS mg/L} = \frac{(\text{A}-\text{B}) \times 1000}{(\text{ml sample used})}$$

Where:

A = Weight of dried + dish, mg.
B = Weight of dish, mg.

9.0 QUALITY CONTROL:

- 9.1 Duplicates are analyzed for every 20 samples.
- 9.2 A blank is analyzed every batch.
- 9.3 One spike sample is analyzed every 20 samples.
- 9.4 One reference check sample every 3 months or anytime analyzing samples, originating from New Hampshire.
- 9.5 Spike preparation.

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9.5.1 To a 100mls Graduate cylinder add 50ml of sample to 50ml of Spike std. containing 200mg/L of Sodium Chloride.

9.5.2 Mix sample well and analyze as per SOP section 7.3 thru 7.5.

9.6 Spike Recovery and Duplicate Analysis

9.6.1 % Spike recovery =
$$\frac{(\text{Spike recovery value} - \text{Sample value})}{\text{Spike level added}} \times 100$$

9.6.2 Duplicate relative percent difference RPD

$$\text{RPD} = \frac{(\text{Sample value} - \text{Duplicate sample value})}{(\text{Sample value} + \text{Duplicate Value})/2} \times 100$$

10.0 REFERENCES:

10.1 EPA Method for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1979. Revised/83, Method 160.1.

10.2 American Public Health Association, Standard Method for Examination of Water and Wastewater 1992, 18th Edition, Part 2540C.

10.3 Federal Register 40CFR, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act, Technical Amendment, Vol. 59, No. 20, January 31, 1994.



TOTAL ANALYTICAL SERVICES FOR A SAFE ENVIRONMENT

nytest environmental inc.

NEI SOP No. : 937
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STANDARD OPERATING PROCEDURE
RESIDUE, NON FILTERABLE
IN WATER SAMPLES
TSS

PREPARED BY:

Remo Gigante 8/29/94
Remo Gigante, Acting QA/QC Director

APPROVED BY:

Buddhadeb Nath 8/30/94
Buddhadeb Nath, Wet Chemistry Supervisor

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Steve Wesson, Lab operations Manager

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1.0 SCOPE AND APPLICATION:

This method applicable to drinking, surface, and 4.0 saline waters, domestic and industrial wastes with a range of mg/L to 20,000mg/L.

2.0 SAFETY ISSUES:

The toxicity or carcinogenicity of each reagent is used in this method has not been precisely defined. However, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. Nei maintains a current awareness file of Occupations Safety Health Administration (OSHA) regulations regarding the safe handling of the chemicals specified in this method. A reference file of Material Safety Data Sheets (MSDS) is also available to all personnel involved in chemical analysis.

3.0 SAMPLE HANDLING:

3.1 Storage: Plastic or glass container, 250ml.

3.2 Preservation: Refrigerate at 4°C.

3.3 Holding time: 7 days from collection day.
NYSASP: 5 days from VSR

4.0 INTERFERENCES:

4.1 Filtration apparatus, filter material, pre-washing, post-washing, and drying temperature are specified because these variables have been shown to affect the results.

4.2 Samples high in Filterable Residue (dissolved solids), such as saline waters, brines and some wastes, may be subject to a positive interference. Care must be taken in selecting the filtering apparatus so that washing of the filter and any dissolved solids in the filter minimizes this potential interference.

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5.0 EQUIPMENT AND APPARATUS:

- 5.1 Glass Fiber disks, 4.7 cm or 2.1 cm without organic Binder, Whatman 934AH or equivalent.
- 5.2 Gooch crucible adapter
- 5.3 Suction flask, 500ml
- 5.4 Gooch crucible, 25ml for 2.1cm disks
- 5.5 Drying oven at 180°C, Drying oven at 100°C
- 5.6 Desiccator
- 5.7 Vacuum pump
- 5.8 Graduate cylinder 100mls
- 5.9 Analytical balance capable of weighing to 0.1mg

6.0 SUMMARY OF METHOD:

A well mixed sample is filtered through a glass fiber filter and the residue retained on the filter is dried to constant weight at 103-105°C.

7.0 PROCEDURE:

- 7.1 A glass fiber filter is placed at the bottom of a Gooch-Crucible.
- 7.2 The Crucible is placed in a vacuum apparatus and the suction of the vacuum is applied.
- 7.3 The filter is washed with three (3) successive 20ml portions of DI water.
- 7.4 The suction is continued until all traces of DI water is removed.
- 7.5 The crucible with the filter is removed from the vacuum apparatus and placed in a 103-105°C. oven to dry for one (1) hour.
- 7.6 The crucible with the filter is cooled in a desiccator and weighed before used.

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7.7 100ml of sample or an aliquote depending on the visual observation of the suspended solids present in the sample, is filtered and the filter is washed with three (3) successive 10ml portions of DI water and suction is continued for three (3) minutes after filtration.

7.8 The crucible with filter is removed from the vacuum apparatus and placed in a 103-105°C oven for about one (1) hour.

7.9 After one (1) hour, the crucible with the filter paper is placed in a desiccator to cool and is weighed afterwards.

7.9.1 The drying cycle is repeated until a constant weight is attained or until weight loss is less than 4% of previous weight or 0.5mg, whichever is less.

8.0 CALCULATIONS:

$$\text{TSS mg/L} = \frac{(A-B) \times 1000 \text{ ml/L}}{\text{Sample used vol (ml)}}$$

Where:

A = weight of filter and residue, mg (after drying)
B = weight of filter, mg

9.0 QUALITY CONTROL:

9.1 One method blank every twenty (20) samples

9.2 One duplicate every twenty (20) samples

9.3 One laboratory references sample every 3 months or anytime analyzing samples originating from New Hampshire.

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10.0 REFERENCES:

- 10.1 EPA Method for Chemical Analysis of Water and Wastes;
EPA-600/4-79-020, March 1979. Revised 3/83, Method:
160.2.
- 10.2 American Public Health Association; Standard Method for
the Examination of Water and Wastewater, 1992. 18th
Edition, part 2540D.
- 10.3 Federal Register 40CFR, part 136; Guidelines
Establishing Test Procedures for the Analysis of
Pollutants Under the Clean Water Act. Technical
Amendment, volume 59, No 20, January 31, 1994.

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NEI SOP NO. : 911
PREPARATION DATE : 3/16/94
REVISION NO. : 1
REVISION DATE : 8/30/94
PAGE : 1 of 8

STANDARD OPERATING PROCEDURE

FOR

DETERMINATION OF OIL & GREASE

IN AQUEOUS ENVIRONMENTAL SAMPLES

PREPARED BY:

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11/4/94
DATE

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1.0 SCOPE AND APPLICATION

1.1 This method is applicable to surface and saline waters. Industrial and domestic wastes. The range covers to 1000mg/l of extractable material. The method is not applicable to light hydrocarbons that volatilize below 70°C. Gasoline, Kerosene, #2 Fuel Oil are completely or partially lost during solvent removal operation.

2.0 METHOD OF SUMMARY

2.1 The sample is acidified to a low pH (,2) and serially extracted with fluorocarbon-113 in separatory funnel. The solvent is distilled and the residue weighed to constant weight. Reporting limit, 1.0 mg/l.

3.0 SAFETY ISSUES

The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined. However, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. NEI maintains a current awareness file of Occupational Safety and Health Administration (OSHA) regulations regarding the safe handling of the chemicals specified in this method. A reference file of Material Safety Data Sheets (MSDS) is also available to all personnel involved in chemical analyses.

4.0 INTERFERENCES

4.1 Matrix interferences will likely be coextracted from the sample. The extract of these interferences will vary from waste to waste, depending on the nature of the waste being analyzed.

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5.0 SAMPLE HANDLING

- 5.1 Holding Time: 28 days from collection date, ASP 26 days from VRT
- 5.2 Preservation: Sulfuric or Hydrochloric acid to pH <2, cool 4°C
- 5.3 Container: Wide mouth glass with cap teflon insert

6.0 APPARATUS & MATERIALS

- 6.1 Separatory funnel, 2000ml with teflon stockpot
- 6.2 Erlenmeyer flasks, 125ml or equivalent
- 6.3 Filter paper, Wharman No. 40, 11cm or equivalent
- 6.4 Water bath capable to keep temperature at 70°C
- 6.5 Distilling unit Claisen or equivalent
- 6.6 Vacuum pump or other source of vacuum
- 6.7 Class A volumetric flask, 200ml

7.0 REAGENTS

- 7.1 Fluorocarbon-113 (1,1,3-Trichloro-1,2,2-Trifluoroethane) B.P. 48°C.
- 7.2 Sodium sulfate, anhydrous crystals
- 7.3 Hydrochloric acid 1:1 (50% by volume)
- 7.4 ASTM Type II Water or equivalent
- 7.5 Wesson Oil
- 7.6 #2 Fuel Oil

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8.0 PROCEDURES

8.1 Analysis Preparation

- 8.1.1 The day before Oil & Grease analysis, several sets of 125ml Erlenmeyer flasks are prepared, cleaned, labelled and placed in a 103°C oven for $\frac{1}{2}$ hour, then the glassware are placed in desiccators to cool overnight. Handle flask all the time with gloves to constant weights to avoid fingerprints.
- 8.1.2 The flasks are weighted and the weights are recorded in logbook.
- 8.1.3 The separatory funnels and long stemmed funnels are cleaned, dried and each are rinsed with 30ml portion of Freon 113.
- 8.1.4 Enough anhydrous sodium sulfate is placed to fill the bottom of the cones made with the filter paper. The each portion of sodium sulfate is washed with three (3) successive 10ml volumes of Freon 113.
- 8.1.5 After washing the sodium sulfate with Freon 113, the 125ml labelled Erlenmeyer flasks are placed under the long stemmed funnels where the Oil & Grease extracts are collected.

8.2. Oil & Grease extraction and detection

- 8.2.1 Mark the sample bottle at water meniscuous for later determination of sample volume. Pour sample in separator funnel.
- 8.2.2 Add 30ml of Freon 113 sample. After addition of Freon 113, the samples are shaken vigorously for three (3) minutes. After shaking, the samples are allowed to sit and to separate into two distinct layers. Release pressure from separatory funnel as needed.

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8.0 PROCEDURES - continued

- 8.2.3 The freon layer containing the Oil & Grease is separated and past through the anhydrous sodium sulfate into the Erlenmeyer flasks.
- 8.2.4 The samples are extracted with two or more portions of 30ml Freon 113 as per section 8.7 and 8.8, afterwards the sodium sulfate (anhydrous) is washed with two (2) successive 5ml portion of Freon 113.
- 8.2.5 Connect the flasks with distilling head and place in a water bath at 70°C for about $\frac{1}{2}$ hour to distill solvent. When the temperature of the distilling head reach 50°C or the flask appears dry remove the distilling head.
- 8.2.6 Sweep out the flask for 15 seconds with air to remove solvent vapor by inserting a glass tube connected to vacuum source. Immediately remove flask from heat source, wipe the outside, cool in a desiccator for 30 minutes and weigh to constant wt.

9.0 LABORATORY CONTROL SAMPLE/SPIKING SOLUTION PREPARATION

- 9.1 Stock standard: Weigh 1.00 gram of wesson oil and 1.00 gram of #2 Fuel Oil in 200ml volumetric flask. Dissolve in freon and bring to volume. 1ml = 10mg Oil & Grease. Refrigerate standard when not in use, bring to room temperature before using. Shelf life 6 months.
- 9.2 Laboratory control sample: In a separatory funnel, add 1000ml of DI water, add 1ml of LCS stock standard and analyze as sample, starting from section 8.2.2.
- 9.3 Sample spiking: Pour sample in separator funnel, add 1ml of stock standard equivalent to 10mg / Oil & Grease. Continue analyzing as per section 8.7.

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10.0 QUALITY CONTROL

10.1 One duplicate per 20 samples

10.2 One reagent blank per 20 samples or each determination

10.3 One laboratory control sample per 20 samples

10.4 One spiked sample per 20 samples

11.0 CALCULATIONS

$$\text{mg/l Total Oil \& Grease} = \frac{(A - B) - C}{V \times 1000}$$

Where:

A - B = Residue on flask in grams
A = weight of sample residue and flask in grams
B = weight of flask in grams
C = weight of reagent blank residue in grams
V = volume of sample, determined by refilling sample bottle to calibration list in liters.

11.2 Laboratory Control Sample % Recovery

$$\frac{\text{Recovered Oil \& Grease mg/l}}{10} \times 100$$

11.3 % Recovery of Spike Sample

$$\% R = \frac{\text{Oil \& Grease from spiked sample} - \text{Oil \& Grease from unspiked sample}}{10 (\text{mg Oil \& Grease added})} \times 100$$

11.4 Duplicate Relative Percent Difference

$$\frac{\text{Oil \& Grease Sample} - \text{Oil \& Grease Duplicate}}{2} \times 100$$

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12.0 References

12.1 EPA Method for Chemical Analysis of Water and Wastes. EPA-600/4-79-02-0 March 1979 Revised 3/83 Method 376.1

12.2 American Public Health Association: Standard Method for the examination of water and waste water 1992 18th Edition part 5520D

12.3 Federal Register 40 CFR Part 136 Guidelines established Test Procedures for the analysis of pollution under the Clean Water Act, Technical Amendment Volume 59 no. 20, January 30, 1994

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APPENDIX V

STANDARD OPERATING PROCEDURES FOR EFFLUENT PARAMETERS

Effluent parameters for discharge to the sanitary sewer have not yet been established by the Butler County Department of Environmental Services (BCDES). When BCDES does issue an authorization to discharge, the applicable standard operating procedures will be inserted into this Appendix.

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SUPPORT PLAN B

SKINNER LANDFILL SUPERFUND SITE
FIELD SAMPLING PLAN
WEST CHESTER, BUTLER COUNTY, OHIO

Rust Environment & Infrastructure of Ohio Inc.
PROJECT NO. 72680

May 20, 1996

LIST OF ACRONYMS

AMP	Air Monitoring Plan
AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
BOD	Biochemical Oxygen Demand
CLP	Contract Laboratory Program
COD	Chemical Oxygen Demand
Conrail	Consolidated Railroad Corporation
CP	Contingency Plan
CQAP	Construction Quality Assurance Plan
DNAPLs	Dense Non-Aqueous Phase Liquids
FS	Feasibility Study
FSP	Field Sampling Plan
GWDI	Groundwater Design Investigation
HASP	Health and Safety Plan
HCl	Hydrochloric Acid
HDPE	High Density Polyethylene
ID	Inner Diameter
LTPP	Long Term Performance Plan
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSL	Mean Sea Level
NPL	National Priority List
OEPA	Ohio Environmental Protection Agency
OSHA	Occupational Safety & Health Administration
PCBs	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
PRP	Potentially Responsible Party
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	Remedial Action
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
Rust E&I	Rust Environment & Infrastructure of Ohio Inc.
su	Standard Units
SOP	Standard Operating Procedure
SOW	Statement of Work
SPCC	Spill Prevention Control and Countermeasure Plan
SVE	Soil Vapor Extraction
SVOCs	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TCL	Target Compound List
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
U.S. EPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

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Appendix

Rust Standard Operation Procedures I

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1.0 PROJECT DESCRIPTION

This document is the Remedial Action (RA) Field Sampling Plan (FSP) for the Skinner Landfill Superfund Site located in West Chester, Butler County, Ohio. This document addresses the requirements of the Remedial Design (RD) Statement of Work (SOW), Section II, B.3 that identifies a Final FSP will be submitted as part of the Pre-Final Design Document.

The RA FSP has been prepared pursuant to the requirements of the SOW of the Administrative Order on Consent (AOC) between the United States Environmental Protection Agency (U.S. EPA) and the Skinner Landfill Potentially Responsible Party (PRP) Group dated June 4, 1993. The selected RA components were based on the SOW and were modified based on the results of the RD Design Investigation. The RD Design Investigation was completed during the Fall of 1994 and the corresponding report is dated June 1, 1995. The RA components (as modified by the results of the RD Design Investigation) include the following:

- Institutional Controls;
- Engineered Landfill Cover;
- Groundwater Interception System (and sanitary sewer tie-in);
- Groundwater Monitoring; and
- Surface Water Monitoring.

1.1 Site Location and Description

The Skinner Landfill is located approximately 15 miles north of Cincinnati, Ohio near West Chester, Butler County, Ohio in Township 3, Section 22, Range 2. The site is located along Cincinnati-Dayton Road as shown in Figure 1. The site is bordered on the south by the East Fork of Mill Creek, on the north by wooded land, on the east by a Consolidated Railroad Corporation (Conrail) railroad right-of-way, and on the west by the Skinner Creek.

The site is located in a highly dissected area that slopes from a till-mantled bedrock upland to a broad, flat-bottomed valley that is occupied by the main branch of Mill Creek. Elevations on the site range from a high of nearly 800 feet above mean sea level (MSL) in the northeast, to a low of 645 feet MSL near the confluence of the Skinner Creek and the East Fork of Mill Creek. Both Skinner Creek and the East Fork of Mill Creek are small, shallow streams. Both of these streams flow to the southwest from the site toward the main branch of Mill Creek. A third on-site stream, Dump Creek, borders the landfill on the east. Dump Creek is intermittent and flows south into the East Fork of Mill Creek. Three shallow ponds are also located on the site.

In general, the site is underlain by relatively thin glacial drift over interbedded shales and limestones of Ordovician age. The composition of the glacial drift ranges from intermixed silt, sand and gravel, to silty, sandy clays; and its thickness ranges from zero to over 40 ft on the site. The sand and gravel deposits comprise the hills and ridges and are encountered near the surface of the central

portion of the site. The silts and clays usually occur as lenses in the sands and gravel or directly overlie bedrock.

1.2 Site History and Background

The property was originally developed as a sand and gravel mining operation, and was subsequently used as a landfill from 1934 to 1990. According to U.S. EPA studies, materials deposited at the site include demolition debris, household refuse and a wide variety of chemical wastes. The waste disposal areas include a now-buried waste lagoon near the center of the site and a landfill. According to U.S. EPA studies, the buried waste lagoon was used for the disposal of paint wastes, ink wastes, creosote, pesticides, and other chemical wastes. The landfill area, located north and northeast of the buried lagoon, received predominantly demolition and landscaping debris.

In 1976, the Ohio EPA (OEPA) initiated an investigation of the site in response to reports of a black oily liquid that was observed during a fire call to the site. Before the OEPA could complete the investigation, the landfill owners, the Skinners, covered the lagoon with a layer of demolition debris. Mr. Skinner further dissuaded the OEPA from accessing the site by claiming that nerve gas, mustard gas, and explosives were buried in the landfill. The OEPA requested the assistance of the U.S. Army after obtaining this information. Mr. Skinner later retracted his statements concerning buried ordnance, and an U.S. Army records review performed in 1992 did not reveal any evidence of munitions disposal at the site.

In 1982, the site was placed on the National Priority List by the U.S. EPA based on information obtained during a limited investigation of the site. The investigation indicated groundwater contamination had occurred as a result of the buried wastes. In 1986, a Phase I Remedial Investigation was conducted that included sampling of groundwater, surface water and soil, as well as a biological survey of the East Fork of Mill Creek and Skinner Creek. A Phase II Remedial Investigation was conducted from 1989 to 1991 and involved further investigation of groundwater, surface water, soils and sediments. A Baseline Risk Assessment and Feasibility Study (FS) were completed in 1992.

The Phase II Remedial Investigation revealed that the most contaminated media at the site is the soil from the buried waste lagoon. Lower levels of contamination were also found in soils on other portions of the site and in the groundwater, and very low levels were found in the sediments of the Mill Creek, the Skinner Creek, the Duck Pond, and the Diving Pond. Migration of the landfill constituents has been limited, and the Phase II Remedial Investigation concluded that there had been no off-site migration of landfill constituents via groundwater flow.

In the ROD, U.S. EPA selected a remedy for the site consisting of multi-media capping of the landfill and the buried waste lagoon, and interception and treatment of the contaminated groundwater. The ROD also required an investigation be conducted to determine the feasibility for soil vapor extraction (SVE) in the granular soil adjacent to the buried lagoon.

The RD Design Investigation performed in 1994 was implemented to collect data required to assess the feasibility of the SVE and to design the multi-media cover and the groundwater extraction and treatment systems. Based on the results of the RD Design Investigation, necessary data was collected to design the U.S. EPA selected remedies. The following results were developed based on the RD Design Investigation:

- Groundwater collected during previous investigations and the Groundwater Design Investigation (GWDI) indicated groundwater has been impacted at the Skinner Landfill Site and the current groundwater conditions are similar to those used to develop the ROD;
- Trigger levels used in the Administrative Order to define groundwater contamination were modified based on the methods described in the RD SOW;
- A combination of interception trenches and cut-off wall were proposed as the downgradient groundwater control system;
- Effluent discharge standards for the treated groundwater were proposed;
- The extent of contaminated soil from three isolated areas and the Northeastern Corner were defined. Contaminated soil was only identified at two of the isolated areas (at BP01/BP02 and around GW-38) and was not identified in the Northeastern Corner;
- The limits of landfill waste were defined; and
- The SVE system for the removal of organic vapors within the permeable materials adjacent to portions of the buried waste lagoon was determined not to be feasible.

1.3 Project Objectives and Scope

This RA FSP is an integral part of the RA Quality Assurance Project Plan (QAPjP) and consolidates the sampling requirements for use by the field personnel during the construction of the RA's. This plan includes the sampling plans, sampling procedures and methodologies, and details of the RA sampling efforts to be used during the RA construction activities. The RA FSP also defines the methodologies and procedures to be used to re-evaluate and confirm the baseline surface water and groundwater conditions at the end of the RA construction activities. Sampling and analysis activities to be used after the RA construction activities are defined in the Long Term Performance Plan (LTPP).

The following field sampling activities will be conducted during the RA construction activities:

- Well Abandonment;
- Sample and analyze soils during excavation of contaminated soils;
- Install piezometers and groundwater monitor wells;
- Measure the potentiometric surface in monitor wells, in piezometers, in the interceptor trench, and in the East Fork of Mill Creek;
- Sample and analyze groundwater from monitor wells; and
- Sample and analyze surface water.

Throughout this document Standard Operating Procedures (SOPs) will be referenced. These SOPs (see Appendix I) define sampling methodologies and procedures that will be followed during the RA field activities.

1.4 RA Supporting Work Plans

The following work plans will be followed during the implementation of the RA construction activities.

1.4.1 RA Quality Assurance Project Plan

The RA QAPjP defines the site-specific Quality Assurance (QA) methods and quality controls (QC) that will be used to collect and analyze samples during this project. The RA QAPP is designed to ensure that the quality, precision, accuracy and completeness of the data generated meets the established data quality objectives.

1.4.2 RA Health and Safety Plan

The RA HASP addresses the site-specific health and safety requirements that will be used during the field activities of this project. These health and safety requirements were developed in accordance with the Occupational Safety & Health Administration (OSHA) regulations and U.S. EPA guidance documents.

1.4.3 RA Spill Prevention Control and Countermeasures Plan

The RA Spill Prevention Control and Countermeasure Plan (SPCC) defines the methods and procedures in the event of a spill during the RAs or subsequent monitoring activities. This plan covers spill procedures, notification procedures, and spill prevention methods.

1.4.4 RA Air Monitoring Plan

The RA Air Monitoring Plan (AMP) defines the project requirements and SOPs to be used for both personal air monitoring and perimeter air monitoring. The intent of the air monitoring is to determine the effectiveness of on-site controls (i.e., monitor airborne contaminant migration in excess of the action levels specified in the RA AMP and the RA HASP) and to define the level of personal protective equipment (PPE) to be worn by the RA field personnel.

1.4.5 RA Contingency Plan

The RA Contingency Plan (CP) defines the methods and procedures to be used during the remedial activities at the site. This plan addresses responsibilities of plan implementation, emergency service contacts and protocols for implementation of the plan. Types of emergencies addressed in the plan includes fires and explosions, serious personal injury, chemical exposure, release of hazardous materials and unsafe working conditions.

1.4.6 RA Construction Quality Assurance Plan

The RA Construction Quality Assurance Plan (CQAP) defines the performance requirements to be used to monitor the construction materials and activities during the implementation of the RA's. This plan also specifies the sampling requirements and procedures to be used to evaluate the conformance of the RA construction contractor(s) with project drawings and specifications.

1.4.7 RA Long Term Performance Plan

The RA LTPP defines the sampling requirements to monitor the effectiveness and performance of the RA components. Groundwater and surface water monitoring will be conducted to determine if the water quality Applicable or Relevant and Appropriate Requirements (ARAR's) are exceeded at any time during operation of the RA. The LTPP will be implemented after construction of the RA components including the final RA surface water and groundwater sampling event.

2.0 RA FIELD INVESTIGATIONS

This document includes detailed descriptions of field activities to be used during the construction of the RA's at the Skinner Landfill Site. These field activities are as follows:

- Abandon 32 monitor wells;
- Excavate the contaminated soil/waste in two isolated areas (the buried pit area BP01/BP02 and around well GW-38) and confirm the removal of contamination from the excavated pits through chemical analyses;
- Install 9 monitor wells downgradient of the interception system, 6 piezometers upgradient of the interception system, 6 piezometers within and around the landfill, and 1 DNAPL well downgradient of the buried waste lagoon;
- Measure the groundwater levels in 12 piezometers, 1 DNAPL well, 9 new monitor wells, 5 existing monitor wells, and in the interceptor trench;
- Measure the surface water elevations at two bench mark locations;
- Measure the presence of DNAPL's in one DNAPL well, 9 new monitor wells, 2 existing monitor wells, and in the interceptor trench;
- Sample and analyze groundwater during RA construction activities; and
- Sample and analyze the surface water quality at eight locations during the RA construction activities.

2.1 Abandon Existing Monitor Wells

Thirty-two existing groundwater monitor wells (see Table 1) will be abandoned during the construction of the RA's. The existing well locations are shown on Drawing 1. All monitor wells will be abandoned per the requirements of OEPA using the following procedure:

- Remove outer protective casing from the well. Excavate and remove guard posts and the concrete pad;
- Attempt to pull well casing out of the ground. If the well casing cannot be pulled out of the ground over-drill the casing and ream the borehole clean;
- Boreholes will be grouted with neat cement or bentonite grout. The cement grout will consist of Portland cement, bentonite and water in proportions of not more than 8 gallons of potable water per bag of cement (94 lbs) and bentonite powder (5 lbs);

- Grout will be tremied into all boreholes greater than 40 ft in depth. Grout will be poured down the boreholes less than 40 ft in depth; and
- Surface will be filled in to avoid a depression over the well location.

2.2 Excavation of Contaminated Soil

The extent of contaminated soil at two locations was refined during the Contaminated Soil Design Investigation. The contaminated areas include the Buried Pit area (BP01/BP02) and the area around monitor well GW-38. The extent of the contaminated soil and proposed soil sample locations are included in Figures 2 and 3.

The contaminated soil will be excavated and moved to the landfill for incorporation under the landfill cover. After excavation of the contaminated areas, soil samples will be collected from each excavation (from the 4 sidewalls and from the bottom of the excavation). A pre-cleaned stainless steel spoon will be used to collect the samples and the samples will be placed in laboratory-supplied sample jars. Custody requirements of the samples are defined in Section 5.0 of the RA QAPP.

Soil samples will be analyzed for the parameters listed in Table 7. Based on a comparison of the results of this analysis with the trigger levels listed in Table 7, it will be determined if the contaminated soil has been removed. If the analysis is less than the trigger levels, the excavations will be backfilled with clean sand and gravel. However, if the chemical analysis of any of the soil samples indicates constituents are greater than the Table 7 trigger levels additional soil will be excavated. In the event the trigger levels are exceeded, excavation will continue until the chemical analysis of the samples taken are less than the trigger levels in both areas

3.0 GROUNDWATER MONITORING

Per Section II, d. of the SOW, a downgradient groundwater control system is required at the Skinner Landfill Site. This interception system is designed to intercept and capture groundwater migrating from the landfill to the East Fork of Mill Creek. The general requirements and site location of the Interception System are defined in Section 2.0 of the Design Report.

The groundwater monitoring system will be used to assess the long-term performance of the Groundwater Interception System (interceptor trench and cut-off wall), evaluate the possible presence and/or movement of DNAPLs in the vicinity of the buried waste lagoon and evaluate the groundwater depression underneath the cover after completion of the RA construction activities (see LTPP).

3.3.1 Proposed Monitor Well and Piezometer Locations

Nine new groundwater monitor wells (see Table 2 for well numbers) and two of the remaining five groundwater monitor wells (GW-06 and GW-07R) are proposed as sampling locations. These wells will be used to confirm or update the groundwater conditions and to monitor the long term performance of the groundwater interception system. One additional monitor well (GW-66) will be installed downgradient of the buried waste lagoon to monitor for the presence of DNAPLs in accordance with the Statement of Work. Twelve new piezometers will be installed to monitor liquid levels. Six piezometers (P-1 to P-6) will be located upgradient of the interception system to re-evaluate and confirm the water level elevations upgradient of the groundwater interception system and to determine the water level elevations after construction of the RA's. The other six piezometers (P-7 to P-12) will be installed in and around the landfill to monitor water levels within the landfilled waste after the RA cover construction activities.

Factors considered for selecting the monitoring well and the piezometer locations included:

- The existing hydrogeology relative to the location of the Skinner Landfill, the proposed trench alignment, and the East Fork of Mill Creek;
- The presence of vertically and laterally transitional soil units that are discontinuous, and vary in permeability and thickness;
- Site morphology; and
- Potential affects on groundwater flow by the constructed of the interception system and its proximity to the East Fork of Mill Creek.

The number and spacing of monitor wells were chosen based on data and conclusions reported for the GWDI. The final location of the individual wells may be refined in the field based on data collected during the well installation.

The proposed groundwater monitor well locations to be sampled for chemical analysis include the two existing monitor wells (GW-06 and GW07R) and the nine new monitor wells (GW-58 to GW-65). In the event GW-06 is damaged during the excavation of the soil around GW-38 and cannot be repaired, a replacement well (GW-06R) will be installed to replace GW-06. The monitor well and piezometer locations are shown in Drawing 2. The target depth of the monitor wells is shown in Table 4. The final depth of the screened interval may be refined based on data collected during the well drilling.

3.3.2 Borehole Drilling and Sampling

Four and one-quarter-inch I.D. hollow stem augers will be used to drill through the unconsolidated sediment overlying the bedrock. Subsurface samples of the undisturbed soil will be collected from each borehole for observation and field description. The samples will be collected by using a continuous sampler, in advance of the auger bit. Samples will be scanned in the field using a PID.

Boreholes that will be drilled into the bedrock will be drilled to a depth of approximately two feet below the sediment-bedrock interface (except the piezometers in and around the landfill cover which will be completed at least 10 feet below the potentiometric surface). Bedrock drilling will be conducted using an HQ (4-inch) size diamond-bit, core barrel. Tap water will be added to the borehole to lubricate and cool the drill bit while coring. The estimated volume of water introduced to the borehole during coring will be recorded by the driller. Similarly, the estimated volume of water recovered from the borehole will be recorded by the driller. For subsequent well development three times the difference in these two estimates (water introduced -water recovered) will be added to the minimum volume of water to be removed. All water recovered will be collected and transported to the top of the landfill for disposal at the decontamination pad.

The sediment and bedrock samples collected during borehole drilling will be stored on-site. The samples will be stored in labeled jars and core boxes, and kept under a tarp within the security fence. Samples will be retained for at least one year.

Rock and soil samples will be described in the field by a Geologist. Soil descriptions will include particle size, moisture content, color (using a standardized color chart), consistency and plasticity, fracturing, reactivity to hydrochloric acid (HCl), soil classification and percent recovery. Rock descriptions will include general rock type, color, characteristics affecting groundwater movement and signs of weathering. Characteristics affecting groundwater movement include estimated porosity, estimated permeability, fracturing and bedding. Signs of weathering will include dissolution features, fracture filling, and iron staining. Drill cuttings generated during installation of the monitor wells and piezometers will be containerized and transported to the top of the landfill. The cuttings will be incorporated under the landfill cover during the RA cover construction.

3.3.3 Well and Piezometer Construction

Monitoring wells consist of two-inch diameter PVC pipe. Piezometers will be constructed of 1-1/4-inch diameter PVC Pipe. After drilling to the target depth (see Table 4) the PVC monitor wells or the PVC piezometers will be installed in the boreholes. Well casing and screen will be Schedule-40 PVC with water tight, locking threads. The screen will be machine cut and will have 0.010 inch slots. Monitor wells GW-58 to GW-65, DNAPL well GW-66, and piezometers P-1 to P-6 will be completed with 10-ft screens. Piezometers P-7 to P-12 will be completed with 15-ft screens. Each screen will be capped at the bottom using a threaded, locking bottom cover. The PVC screen will

be placed across the target zone, identified in Table 4. All well screens will be positioned such that 2 to 3 feet of the slotted portion is above the water table.

After the casing and screen is set in the borehole, a No. 5 quartz sand (or equivalent) will be slowly poured into place and the augers will be pulled back, keeping sand in the augers at all times. When the level of the sand pack is 2 foot above the top of the screen, one foot of No. 7 quartz sand (or equivalent) will be placed on top of the No. 5 sand as a filter pack. A minimum of a 2-ft thick layer of bentonite chips or pellets will be placed above the No. 7 sand and allowed to hydrate per the manufacturers specifications. The remainder of the borehole well annulus will be filled with cement-bentonite grout using a tremie pipe.

The monitor wells and all piezometers will be finished at the surface with a locking guard casing (with weep hole), anchored in a 2-ft by 2-ft by 0.5-ft concrete pad. The well ID number will be marked on the guard casing for ease of identification. After completion of the monitor wells and piezometers each location will be surveyed for elevation control. The survey involves determining the elevation of the ground surface and top of the inner riser at each location. Each measurement will be surveyed to the nearest one-hundredth of a foot vertically and tenth of a foot horizontally.

Piezometers P-7 to P-12 will be located in and around the landfill cover. The piezometers will be installed prior to the installation of the landfill cover and will not be constructed with the locking guard casing or concrete pad until after the construction of the landfill cover. During the construction of the landfill cover additional sections of PVC risers may need to be added to the piezometers as the elevation of the landfill is raised with the addition of the landfill cover material. During the cover construction, a high density polyethylene (HDPE) "boot" will be installed over the piezometers and welded to the HDPE landfill liner. Upon completion of the landfill cover, the locking guard casing and concrete pad will be installed at each of the landfill piezometers.

The groundwater wells GW-58 to GW-65, DNAPL well GW-66, and piezometers P-1 to P-6 will be install after the groundwater interception system has been installed.

3.3.4 Monitor Well and Piezometer Development

The completed monitor wells and piezometers will be developed utilizing the following three step process:

- Surge using a decontaminated surge block to loosen sediment or sand that may be lodged in the well screen or fine grain sediment "caked" on the borehole annulus. The surge block will be vigorously moved up and down in the casing, across the entire length of the screen.
- Use a decontaminated bailer to remove any accumulated sediment in the bottom of the screen.

- Pump groundwater using a submersible pump.

Development (pumping) will continue until at least: a) three times the well volume and the net volume of water introduced during coring have been removed and b) the pH, temperature, and specific conductance of the development water has stabilized.

The development water will be considered stabilized when field readings of consecutive well and piezometer volumes of groundwater agree as follows: pH is ± 0.1 su, temperature is $\pm 1^{\circ}\text{C}$, and conductivity is ± 10 umhos. All development water generated will be collected and transported to the decontamination pad for disposal.

4.0 GROUNDWATER SAMPLING PLAN

Groundwater samples will be collected once after completion of the RA construction activities as part of the RA. Groundwater sampling and analysis will be conducted at the locations identified above.

4.1 Sampling Procedure Summary

Groundwater sampling will include the following procedures:

- Pre-sampling Observations and Measurements (Section 4.2);
- Sample Collection (Section 4.3);
- Sample Preparation and Preservation (Section 6.4.3); and
- Chain-of-Custody control (Section 6.4.4).

Specific procedures, described in the sections that follow, include measurement of water levels, measurement of DNAPLs, purging of wells, field measurements of pH, specific conductance, temperature, and beta and gamma radiation, sample collection (bottles, preservation and shipping), chain-of-custody control, and field QA/QC procedures. Operation and maintenance procedures for instruments used for field measurements are presented in Appendix I.

4.2 Pre-Sampling Observations and Measurements

Observations and measurements will be documented in the field logbook prior to sample collection at each monitoring well.

4.2.1 Well Integrity

The purpose of monitoring well integrity is to ensure that the physical integrity of all monitoring wells is maintained and that groundwater samples are representative of the groundwater quality of

the monitored zone. The sampling team is responsible for assessing the following conditions surrounding the well and noting any potential problems in the field logbook:

- Condition of the surface seal;
- Erosion or ponding of surface water/runoff around the casing;
- Subsidence of the soil materials surrounding the casing;
- Animal or insect activity in or around the casing;
- Obstructions which preclude access to the well;
- Determine if flooding of the well has occurred; and
- Other conditions which affect access or obtaining samples or sample integrity.

The conditions near the casing are important to maintaining the integrity of the well. For example, the surface seal acts to prevent surface water from traveling along the casing to the groundwater. Any damage to the seal, including cracks, must be noted and subsequently corrected. Cracks in the surface seal may allow surface water near the well to seep around the plug and down the casing. Such seepage may allow undesirable mixing of surface water with the groundwater which is to be sampled.

The following observations of the external protective casing are to be noted and recorded by the sampling team in the field logbook:

- Locked external guard casing;
- Animal or insect activity in or on the external guard casing;
- Water in the annular space;
- Severe bends or cracks in the external guard casing;
- Cracks in the concrete pad;
- Blocked weep hole; and
- Other conditions affecting the external guard casing including damage caused by vandalism.

The external guard casing serves to protect the internal well casing. Water in the guard casing is undesirable because it may freeze and crush the PVC well casing. Weep holes in the guard casing must be kept clear to allow water to drain from the guard casing.

The sampling team will visually inspect the PVC well casing before each sampling event. The condition of each well will be noted in the field note book as follows:

- Loose casing;
- Bent or damaged casing;
- Any obstructions in the casing; and
- Condition of the well cover.

The field sampling team will report well integrity discrepancies to the Project Manager. The sampling team must immediately notify the Project Manager by telephone if it is impossible to sample a well, or if the sampling team thinks the sample integrity is compromised.

4.2.2 Measurement of Groundwater Elevations

Water-level and depth to well-bottom measurements will be recorded at each of the selected monitoring wells and piezometers (GW-58 to GW-66, GW-06, GW-07R, GW-24, GW-26, GW-30, and P-1 to P-12) using a portable electronic measuring tape. Water levels will also be collected from the interception system and two surface water bench mark locations (BMSW-1 at the bridge near SW-51 and BMSW-2 at the railroad bridge near SW-53). Measurements will be recorded to an accuracy of ± 0.01 feet and will be documented in the field logbook. The measurements will be made relative to a surveyed notch in the top of the PVC casing. The data will be used to calculate the volume of water in the respective well casings and to prepare a potentiometric surface map of the area along the interception system alignment. Additionally, the presence or absence of DNAPLs will be measured using a pre-cleaned electronic solvent-water probe in each of the selected wells and piezometers. Measurements will be recorded to an accuracy of ± 0.01 feet and will be documented in the field logbook. The measurements will be made relative to a surveyed notch in the top of the well casing. The water-level and solvent-water probes will be decontaminated between measurements in accordance with the procedures described below. The groundwater and surface water monitor locations are shown in Drawings 2 and 3 respectively.

4.3 Groundwater Sampling

Purging and sampling equipment will be dedicated to each well to prevent potential cross contamination. Groundwater samples from monitor wells will be extracted using dedicated submersible electric pumps, positive air displacement pumps, or stainless steel and/or teflon bailers.

4.3.1 Well Purging

A least three water column volumes, measured from the top of water to the base of the well, will be purged from each monitoring well prior to sampling. Purging the wells assures that samples are drawn from the aquifer and not from stagnant water left in the well between sampling events. Stabilization of pH, specific conductance, and temperature during well purging must occur before sampling. Purging will be considered complete when the measurements of samples of consecutive water column volumes agree as follows: pH is ± 0.1 su, temperature is $\pm 1^{\circ}\text{C}$, and conductivity is ± 10 umhos). Purge volume calculations will be as follows: Depth to water will be subtracted from the total well depth, and the result multiplied by a conversion factor for well casing size (0.17 for 2.0-inch I.D. wells). This value will be one water column volume, in gallons, which will be multiplied by three to calculate the minimum required purge volume. A graduated five-gallon bucket will be used to measure the volume purged. Actual purge volumes and start and stop times

will be recorded in the field logbook. Purge water will be collected and transported to the Decontamination Area where it will be poured onto the top of the landfill.

When a well bales dry during the well purging process, the well will be allowed to recharge. The samples will be collected as soon as sufficient volume has accumulated in the well.

4.3.2 Sample Collection

Samples will be withdrawn from the monitor wells with the same equipment used for purging. Sample containers will be filled directly from the bailer (or pump) with minimal air contact and without allowing the sampling equipment to contact the containers.

When testing for the presence or absence of Dense Non-aqueous Phase Liquids (DNAPLs) is to be performed, this testing will be performed prior to sample collection. The presence of DNAPLs will be measured with the interface probe used to measure the wells' water levels. After the presence/absence of the DNAPLs have been determined, the groundwater samples will be collected from the wells.

Groundwater samples will be collected unfiltered (except for metals which will be collected as filtered and unfiltered) and analyzed for the parameters listed in Table 8 (Table 1 from the ROD, as modified by the GWDI). Groundwater samples for Volatile Organic Compounds (VOC) analysis will be collected first. Care will be taken to slowly fill the sample containers to minimize volatilization of the VOCs. Each VOC sample container will be filled with no head-space in the sample container. After collecting the VOC samples, the sample containers for SVOCs, Metals, and Cyanide will be filled, respectively.

Measurements of pH, temperature, and specific conductance will be recorded in the field logbook immediately upon sample collection. The analytical procedures for these field measurements are specified in the field measurement SOPs contained in Appendix I of this document. Field measurements will be made in accordance with proper operating procedures for the equipment.

5.0 SURFACE WATER MONITORING PLAN

During the RA, construction activities associated with the installation of the groundwater interception system and the landfill cover could have an impact on the surface water quality of the East Fork of Mill Creek and the Skinner Creek. To evaluate the potential impact(s), the surface water monitoring program will include both chemical and biological monitoring. Surface water monitoring shall commence immediately prior to initiation of RA construction. Surface water sampling will be conducted according to the procedures defined in this section.

5.1 Surface Water Monitoring Point Locations

During the RA, contaminated soil excavation activities at BP01/BP02 and around GW-38 and cover and interception system construction activities may have an impact on the surface water quality of the East Fork of Mill Creek and the Skinner Creek. To monitor the potential impacts, the East Fork of Mill Creek and the Skinner Creek will be evaluated during the RA by collecting and analyzing surface water samples from five sample locations (see Drawing 3 for location of SW-50, SW-51, SW-52, SW-53 and SW-54). Surface water samples from SW-50, SW-51, SW-52, and SW-53 will be collected monthly until the completion of the RA construction activities. Surface water samples from SW-54 will be collected monthly until the completion of the RA excavation activities at BP01/BP02.

Surface water run-off associated with the installation of the groundwater interception system and the landfill cover may have an impact on the surface water quality of the East Fork of Mill Creek. To monitor the potential impacts, the East Fork of Mill Creek will be evaluated during the RA by collecting and analyzing surface water samples from three run-off sample locations (see Drawing 3 for locations of SWD-1, SWD-2 and SWD-3) and comparing the RA results to the data collected during the baseline surface water study conducted during the GWDI. Run-off samples will be collected monthly until the completion of the RA construction activities (but only after a rain event that qualifies for NPDES sampling).

After completion of the RA construction activities, the baseline surface water conditions defined during the GWDI will be re-evaluated to determine if the conditions have changed. To monitor the baseline water quality, surface water samples will be collected and analyzed from four sample locations (see Drawing 3 for locations of SW-50, SW-51, SW-52 and SW-53). These surface water samples will be collected within two week of completion of the RA construction activities and the results will be compared to the data collected during the GWDI.

5.2 Sampling Procedure Summary

Surface water sampling will include the following procedures:

- Pre-sampling Observations and Measurements (Section 5.2);
- Sample Collection (Section 5.2.1);
- Sample Preparation and Preservation (Section 6.4.3); and
- Chain-of-Custody control (Section 6.4.4).

5.2.1 Pre-Sampling Observations and Measurements

Observations and measurements will be documented in the field logbook prior to sample collection at each sample point. These observations will include an estimate of stream surface-flow velocity,

measurements of pH, specific conductance, and temperature. Visual observations will include any potential impact, such as silting, to Skinner Creek or East Fork of Mill Creek.

Run-off samples will be collected at locations SWD-1, SWD-2 and SWD-3 within 24-hours after a rainfall of 0.10 inch or greater. The time and amount of the most recent rainfall will be verified by measurements recorded in the on-site weather station (See Air Monitoring Plan). The National Weather Service at Greater Cincinnati Northern Kentucky Airport will be contacted for rainfall data in the event that the on-site weather station is not operational.

5.2.2 Sample Collection

Sampling will begin at the sample location most downstream and proceed progressively to the upstream locations. Samples will be collected as near to midstream (or midchannel) as possible. Sampling at midstream may be changed in the field due to practical considerations such as safety and minimizing disturbance of sediment by the sample team walking in the stream. The samples will be collected directly from the stream by immersing the sample bottle with its opening pointed down stream. Collecting substrate and floating debris will be avoided. Sample bottles containing preservative should not be immersed in the stream. Instead, they should be filled with an intermediate laboratory supplied bottle. Samples for field parameters will be collected in a clean sample bottle. Field parameters will not be measured directly in the stream unless a stilling well is installed. Stream flow may affect measurements reported by the instruments.

All surface water samples will be analyzed for the parameters listed in Table 8, until the parameter list is modified by the U.S. EPA. Samples for VOC analysis will be collected first. Care will be taken to slowly fill the sample containers to prevent volatilization of the VOCs. Each VOC sample container will be filled with no head-space in the sample container. After collecting the VOC samples, the sample containers for SVOCs, Metals, and Cyanide will be filled, respectively.

Measurements of pH, temperature, specific conductance, and dissolved oxygen will be recorded in the field logbook immediately upon sample collection. The analytical procedures for these field measurements are specified in the field measurement SOPs contained in Appendix I of this document. Field measurements will be made in accordance with proper operating procedures for the equipment.

5.3 Biological Sampling

Biological sampling will be conducted during the RA construction activities and for a period of approximately one year following the completion of construction to determine the potential impacts of the RA activities on the aquatic ecosystem. Biological sampling will include Qualitative Macroinvertebrate Sampling, Fish Community Assessment, and fish bioassays. The macroinvertebrate sampling and fish community assessment will be conducted on a quarterly basis and the fish bioassays on a semi-annual basis, with no sampling conducted during the winter quarter.

Sampling locations will be as close as practical to surface water sampling locations SW-50, SW-51, SW-52 and SW-53. Due to the intermittent nature of the stream, dry conditions may preclude the collection of samples from all sampling points during some portions of the year. Field methods for biological sampling are detailed in SOP-10.

5.3.1 Macroinvertebrate Sampling

Macroinvertebrate fauna can be used to monitor the environmental conditions in a specific location or area. Macroinvertebrates are able to reflect the previous water quality conditions in their environment because:

- o Macroinvertebrates are relatively immobile;
- o macroinvertebrates generally have reasonably long life cycles; and
- o macroinvertebrates include species ranging from tolerant to intolerant to many forms of pollution.

To study the macroinvertebrate communities in the subject study area of the East Fork of the Mill Creek, artificial substrate samplers will be used. The basic artificial substrate sampler to be used in this program will be the Hester-Dendy multiple plate sampler. This type of sampler has been widely used in the investigation of aquatic macroinvertebrate populations.

Macroinvertebrate samples will be collected in each of the four predefined sample locations within the East Fork. These locations include upstream, midstream and downstream sampling points for this ecological study. The records of the macroinvertebrate sampling locations, sampling procedures and any additional pertinent records, will be retained in a field book.

Macroinvertebrate Field Methods

The field methodology to be used for the placement and study of the macroinvertebrate communities in the East Fork will follow the directions provided by the OEPA in their Quality Assurance Manual (6th Update) - Macroinvertebrates - September 30, 1989, Procedure Number WQPA-SWS-3. A "set" (A set consists of the five Hester-Dendy samplers placed at a given station location) of Hester-Dendy Multiple Plate substrate samplers will be placed at each of the selected sampling locations and anchored to a concrete block. The individual Hester-Dendy Multiple Plate substrate samplers will be constructed to provide a total of 145.6 square inches of exposed surface area for benthic colonization. The samplers will remain in the East Fork of the Mill Creek for a period of six weeks.

After the six week interval has elapsed, the individual Hester-Dendy samplers will be retrieved from the East Fork. The samplers will be carefully separated from the concrete block to which they were anchored. The individual samplers will be placed into one-quart plastic containers while still submerged. Extreme care will be taken at this point to avoid disturbing any of the organisms that have colonized the individual sampler plates. After the samplers are placed inside the plastic

containers, sufficient sample preservative will be added to the container to comprise approximately a 10 percent solution of preservative. A station description sheet will be filled out by the field biologist at the time of sample retrieval.

Macroinvertebrate Laboratory Methods

At the laboratory, each East Fork sampling station "set" will be used for laboratory analysis. The individual Hester-Dendy samplers will be disassembled in a bucket of water, the plates will be cleaned of organisms and debris and the plates will be discarded. The mixture of water, organisms and debris will then be placed successively through a U.S. Standard Number 30 Sieve (0.589 mm mesh) and then through a U.S. Standard Number 40 Sieve (0.425 mm mesh). The materials collected in each of the sieves will be placed into labeled jars and 70 percent iso-propanol will be added as a preservative.

Material collected in the 40 mesh screen is counted and identified or counted and extrapolated when the identification is impossible or impractical. Organisms determined to be dead prior to the time of collection are not counted and are discarded. Bryozoan colonies are removed from the sampler plates and saved for identification.

Species level taxonomic identifications will be made where possible. Generic identifications will be used only where an organism is indistinguishable due to morphologic conditions at the time of sample determinations.

Macroinvertebrate Laboratory Data Analysis

After the completion of the taxonomic determinations for the individual samples collected from the East Fork study area, the resulting data will be subjected to detailed analysis. A total of four statistics will be employed in the determination for each individual set of macroinvertebrate data. The four statistics include: 1) The Invertebrate Community Index (ICI), 2) the Community Similarity Index, 3) the Rank Correlation Coefficient and, 4) the Coefficient of Variation.

For the macroinvertebrate population, the following considerations should be evaluated; 1) For individual sampling stations, macroinvertebrate samples may not be representative if the benthic community at the artificial substrate provides different habitat than those available in the natural sediments surrounding the sampling points and, 2) Excessive sedimentation, high or low flows during the six week colonization period can result in loss or reductions in the quality of the data collected.

5.3.2 Fish Community Assessment

As part of the study program for the East Fork, a fish sampling program will be conducted. This program will use electroshocking techniques to obtain fish sample population information for

portions of the East Fork within the study area. Electrofishing methods are a routine method for collection of fish information from freshwater stream systems.

Electrofishing is particularly useful in obtaining fish from habitats that cannot be efficiently sampled with nets: such as undercut banks of streams, low flow channels, amongst boulder areas and from areas with heavy weed growth. Because fish collected with this technique are not necessarily killed, this system is a generally non-destructive sampling method.

The electrofishing equipment used can vary significantly in design and in the intended water body for which the equipment is used. The "backpack" shocker is most commonly used in small wadeable streams and in the shallow portions of lakes. Larger shockers are used for lakes and consist of the electroshocker, generator and the electrodes configured on small boats.

Field Sampling Methods

For this East Fork study program the selection of the fish sampling sites is based on several factors including 1) the location of the point source discharges, 2) location of non-point sources of pollution, and 3) variability within the macrohabitats. At present there are four sampling areas designated for the fish sampling program. These areas generally coincide with the portions of the Mill Creek to be evaluated and sampled using the macroinvertebrate samplers. Differences in fish habitat will be noted where they occur based on detailed field observations.

Most of the individuals are identified to species in the field. In those instances when the taxonomy of a particular fish is uncertain, a specimen of the subject fish will be preserved for future identification, noting date, stream, and approximate location.

Fish will be weighed as separate individuals or in aggregate as a species depending on the catch success and the individual characteristics of the sampled population. All fish that are weighed either collectively or individually will be examined for the presence of gross external anomalies. The occurrence of anomalies will be noted as part of the field record. The list of anomalies recorded for the fish will consist of the OEPA anomaly listing used in the FINS system. The typical anomalies that are recorded for fish include; 1) deformities, whether anthropogenic or chemical in cause, 2) eroded fins, 3) lesions and ulcers, 4) tumors, 5) anchor worms, 6) black spot, 7) leeches, 8) fungus, 9) Ich or Ichthyophthirus multifilis, and 10) Popeye.

The fish sampling sites will be documented using the OEPA Site Description Sheet that includes the site geographic information, specific sample location, field sampling crew identification, and habitat characteristics.

Fish Laboratory Methods

Fish that are collected from the field for subsequent identification or observational study are preserved while in the field as previously described. Upon arrival at the laboratory, the fish specimens are immersed rapidly in a fixative solution to preserve the physical anatomical characteristics. Progressive washing with alcohol solutions is conducted until a 70 percent alcohol solution is achieved.

Taxonomic identification of individual specimens will follow suggestions of the OEPA as to reference sources and documentation. Any unresolved taxonomic questions concerning collected specimens will be determined by comparison of the specimen with the Ohio State Museum of Zoology for identification by the curator.

Fish Analytical Methods

As described above under the field sampling methodology, fish data sheets will be completed for each of the individual sampling locations on the East Fork. From the logged fish data sheets, relative abundance information will be derived for the community and the population levels of study. If possible, the FINS system will be used through the OEPA. The relative abundance expressed in terms of numbers per unit distance. The community analysis data will include the numbers of species per sample, cumulative species per sample location, the Shannon indices based on numbers and on weight, the modified index of well-being and the index of biotic integrity.

For the most comparable evaluation using fish, the following considerations should be taken into account: 1) The sampling area should be representative of the reach under analysis. It should include riffles, runs and pools if these habitats are typical of the stream in question; 2) The fish habitat areas including the combination of riffles, stones as well as the size and composition of the sediment materials should be comparable from the upstream and the downstream locations and; 3) The water quality conditions including flow rate, bed configuration and stream width and shading should be comparable for most effective comparison of fish populations sampled from upstream and downstream locations.

5.3.3 Fish Bioassays

Fish tissue samples will be collected to determine if the contaminants of concern are present in living tissue and represent sources for bioaccumulation of contaminant materials. Bioassays can help evaluate to potential for transport of contaminants through the food chain.

Fish will be collected from the same locations as for the fish community assessment using the electrofishing techniques described earlier. The fish obtained for the bioassay will be bagged, labeled and immediately placed in ice coolers. The fish and sampling site will be describe and documented on field data sheets.

Fish Bioassay Data Analysis

The collected fish will be shipped under chain-of-custody to the analytical laboratory. The analytical parameters for the bioassay will include lead, cadmium, selenium, mercury, PCBs, PAHs, and organochlorine.

Environmental benchmark concentrations for ecological evaluation will be established using the surface water and fish tissue sample analytical results for the contaminants of concern. The benchmark concentrations will be established through the comparison of the sampling results with the data obtained from literature review of the LD50 values for the contaminants of concern. In the water or tissue samples, if contaminant concentrations exceed the 1/10 LD50 value for the selected indicator species, further evaluation of this information will be conducted.

6.0 GENERAL SAMPLING PROCEDURES

The following sections address procedures that are applicable to both surface and groundwater sampling.

6.1 Sample Identification Nomenclature

A sample nomenclature system will be used to permit easy identification of the sample types and sample locations when retrieving data, reviewing analytical results, or performing data manipulations. The system selected for this project will consist of the following:

- The two-letter site code will be "SK";
- The matrix code will be either SS for soil samples, GW for groundwater samples, CSW for remedial action construction surface water samples, SW for surface water samples, or SWD for surface water run-off samples;
- The location number will be a two digit number unique to the sample location;
- The QA sample description will be either FB for field blank, FD for field duplicate, TB for trip blank, MS for Matrix Spike or MSD for Matrix Spike Duplicate;
- The sampling round will be designated with a three digit number starting with "100" to avoid potential confusion with prior sampling.

For example, a sample with the sample number SK-SWD3-100 refers to the Skinner Landfill surface water run-off sample, from location SWD-3, collected during the first RA construction sampling event.

6.2 Disposal of Cuttings and Liquids Generated During the Field Activities

Final disposition of all drill cuttings and excavated soil will be on top of the Skinner Landfill beneath the landfill cover. To prevent any soils from eroding off the landfill and migrating off-site,

auger cuttings will be drummed at the drill site and the drums transported on top of the landfill. The soil will remain in drums until the earthwork contractor is ready to prepare the cover subgrade. Excavated soil in drums will be covered with a tarp.

All liquids generated during the field activities will be containerized. These containers will then be transported to the decontamination pad where they will be poured on to the decontamination pad for disposal on top of the landfill. If any decontamination fluids or other Investigation Derived Waste (IDW) is generated after the emplacement of the landfill cap, these materials will be containerized for off-site disposal or, if permission is granted, discharged to the POTW.

6.3 Decontamination Procedures

The following six-step process will be used for decontaminating sample devices in direct contact with the sample:

- 1) Wash sampling equipment in a solution of potable water and non-phosphate detergent;
- 2) Rinse with reagent grade Hexane (if DNAPLs have been determined to be present by visual observation, by the DNAPL probe or through chemical analysis);
- 3) Rinse with reagent grade Methanol (if DNAPLs have been determined to be present by visual observation, by the DNAPL probe or through chemical analysis);
- 4) Rinse with clean potable water;
- 5) Rinse with organic-free deionized water; and
- 6) Air dry equipment and wrap in aluminum foil if sampling equipment is to be stored or transported.

For drilling and heavy excavation equipment, the following decontamination process will be used:

- Remove all large particles of soil with a shovel or other scraping device;
- Clean the surface of the equipment with a high pressure steam cleaner using clean potable water;
- Let the equipment air dry; and
- Store the equipment in a clean area until it is used.

6.4 Sample Handling and Analysis

All samples collected for chemical analyses during this project are assumed to be classified as low level hazard samples or environmental samples. Procedures for low level samples are described below. Samples will be withdrawn from the monitor wells with the same equipment used for purging. Sample containers will be filled directly from the bailer (or pump) with minimal air contact and without allowing the sampling equipment to contact the containers.

Groundwater and surface water samples for VOC analysis will be collected first. Care will be taken to slowly fill the sample containers to minimize potential volatilization of the VOCs. Each VOC sample container will be filled with no head-space. After collecting the VOC samples, the sample containers for SVOCs, pesticides/PCBs, metals, cyanide and other parameters will be filled, respectively.

6.4.1 Field Analysis

Before use in the field, instruments will be calibrated using procedures furnished by the instrument's manufacturer. Sampling personnel will ensure that the instruments are in proper working order and capable of providing accurate and reliable data prior to the sampling event. Equipment logbooks will be maintained and will include the repair history of each instrument. Calibration checks will be recorded in the field logbook per the procedures defined in the SOPs contained in Appendix I.

Measurements of pH, temperature, specific conductance, dissolved oxygen and Beta/Gamma radiation will be recorded in the field logbook immediately upon sample collection. The procedures for these field measurements are specified in the SOPs contained in Appendix I.

6.4.2 Sample Preparation

As each sample is collected in the field, it will be placed in a labeled sample bottle with the appropriate chemical preservatives and stored in an iced cooler. Chain-of-custody documents will be prepared for all samples which will be shipped to the laboratory (per the RA QAPP requirements). Since multiple analyses will be required, different types of containers and preservatives will be necessary. Sample containers and preservatives will be supplied by the laboratory. Containers for collecting samples for VOC analysis will be filled to slightly more than full before the cover is placed on the container to ensure that there is no head space or loss of VOCs from the sample. The number and frequency of the trip blanks, rinsate samples, duplicate samples, and matrix spike/matrix spike duplicates are specified in Table 3 of this document. Samples will be shipped to the laboratory per Section 5.0 of the RA QAPP.

6.4.3 Sample Bottle Preparation and Sample Preservation

Appropriate sample containers and preservatives are presented in Table 5 for groundwater and surface water samples, and Table 6 for soil samples. Samples requiring preservatives shall be preserved in the field with the appropriate reagents supplied by the laboratory. All sample bottles will be certified precleaned. All sample bottles provided by the laboratory will be in accordance with current U.S. EPA guidelines (i.e., Specifications and Guidance for Obtaining Contaminant Free Sample Containers, April 1992).

6.4.4 Storage and Shipping

Samples which will be shipped to the laboratory for analysis will be prepared for shipment using the following procedures:

- Tighten each sample bottle lid hand tight. Place custody tape over the lid and the sample label;
- Place packing material (approx. 3-inches) in the bottom of a waterproof cooler;
- Seal bottles in clear plastic bags and place them in a cooler in such a way that they do not touch;
- Place pre-cooled blue ice in plastic bags (minimum of 3) and arrange them in the cooler around the bottles;
- Fill the cooler with the sample bottles and packing material;
- Place the completed paperwork (i.e., chain-of-custody forms) in plastic bags and tape them to the inside of the cooler lid;
- Tape the cooler drain shut (if the cooler has a drain);
- Close the cooler and secure the lid by taping the cooler completely around the outside with strapping tape at two locations;
- Place the laboratory address on top of the cooler;
- Place "THIS SIDE UP" labels on all four sides and "FRAGILE" labels on at least two sides of the cooler;
- Affix custody seals on front right and back left corners of the coolers. Cover seal with wide clear tape and strapping tape as appropriate;
- Ship each sample cooler to the laboratory by Federal Express using "PRIORITY OVER-NIGHT DELIVERY"; and
- Contact the laboratory if shipment is on Friday or the day before a holiday to ensure laboratory personnel are available to receive the shipment on the following day.

All samples will be preserved on the day they are collected and will be shipped within 24 hours of their collection. All samples will be under chain-of-custody procedures from the moment the samples are collected until the samples have been analyzed, the data reported to the U.S. EPA and the samples properly disposed of.

6.4.5 Corrective Actions

Corrective actions must be taken any time a situation develops that threatens data quality. Corrective action may be required if field audits reveal unacceptable deviation from approved procedures. Corrective action may include immediate resampling and/or reanalysis of a few samples, or the cessation of all analyses with the subsequent resampling and/or reanalysis of all samples upon resolution of the problem.

Specific corrective action for field measurements may include the following:

- Repeat the measurement to check the error;
- Check for all proper adjustments for ambient conditions such as temperature;
- Check the batteries;
- Check the calibration and adjust as necessary;
- Replace the instrument or measurement devices; and
- Stop work (if necessary).

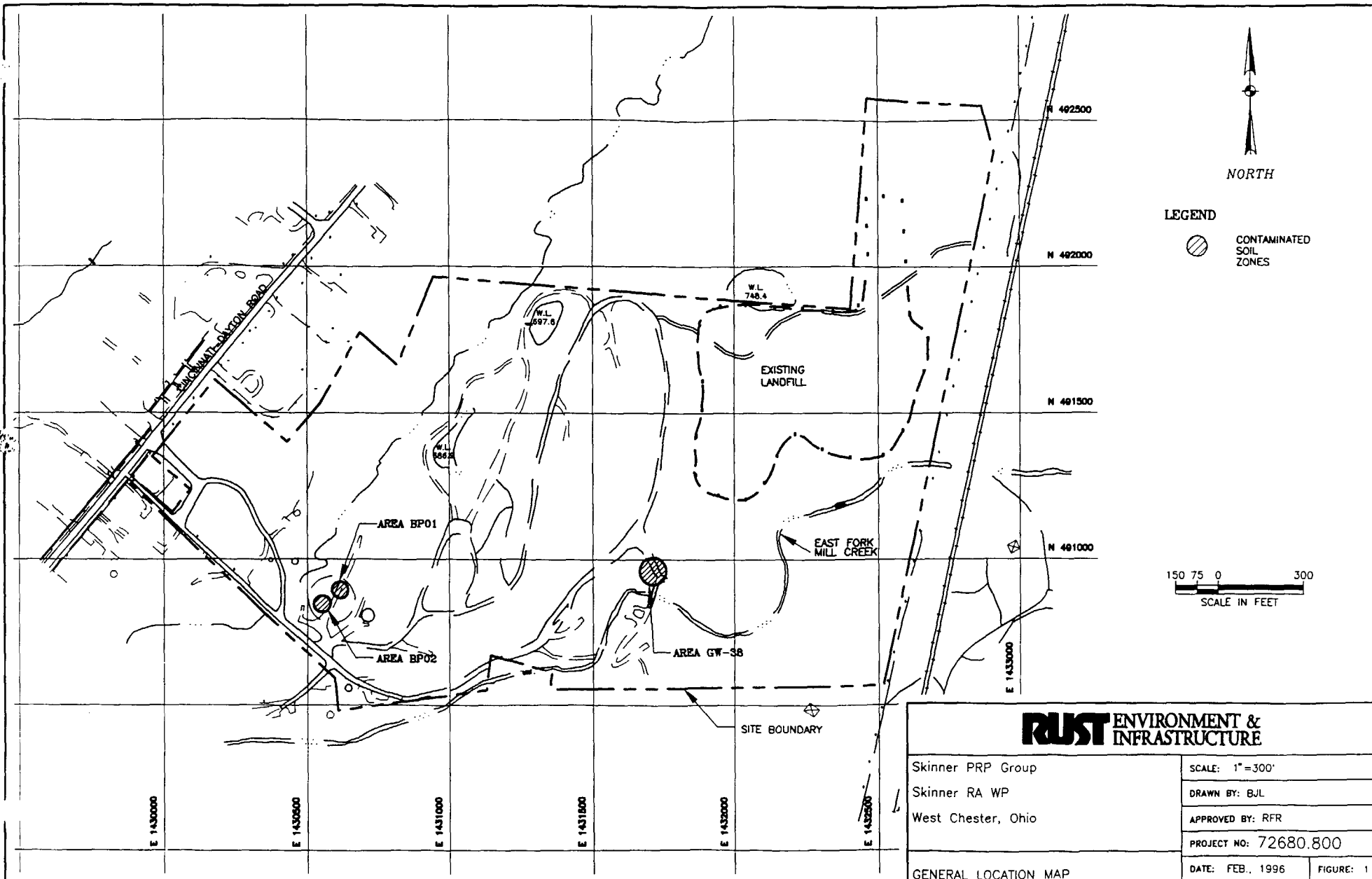
Corrective actions during the field activities may involve:

- Field Team Leader;
- Field Team Members;
- Project Manager;
- PRPs Project Coordinator;
- U.S. EPA Personnel; and/or
- Agency Personnel.

A QC problem that cannot be solved by immediate corrective action must be thoroughly investigated to determine the extent of the problem and to ensure that all samples affected by the problem are identified and analyzed. If a problem during field activities cannot be immediately solved, the Field Team Leader should contact the Project Manager.

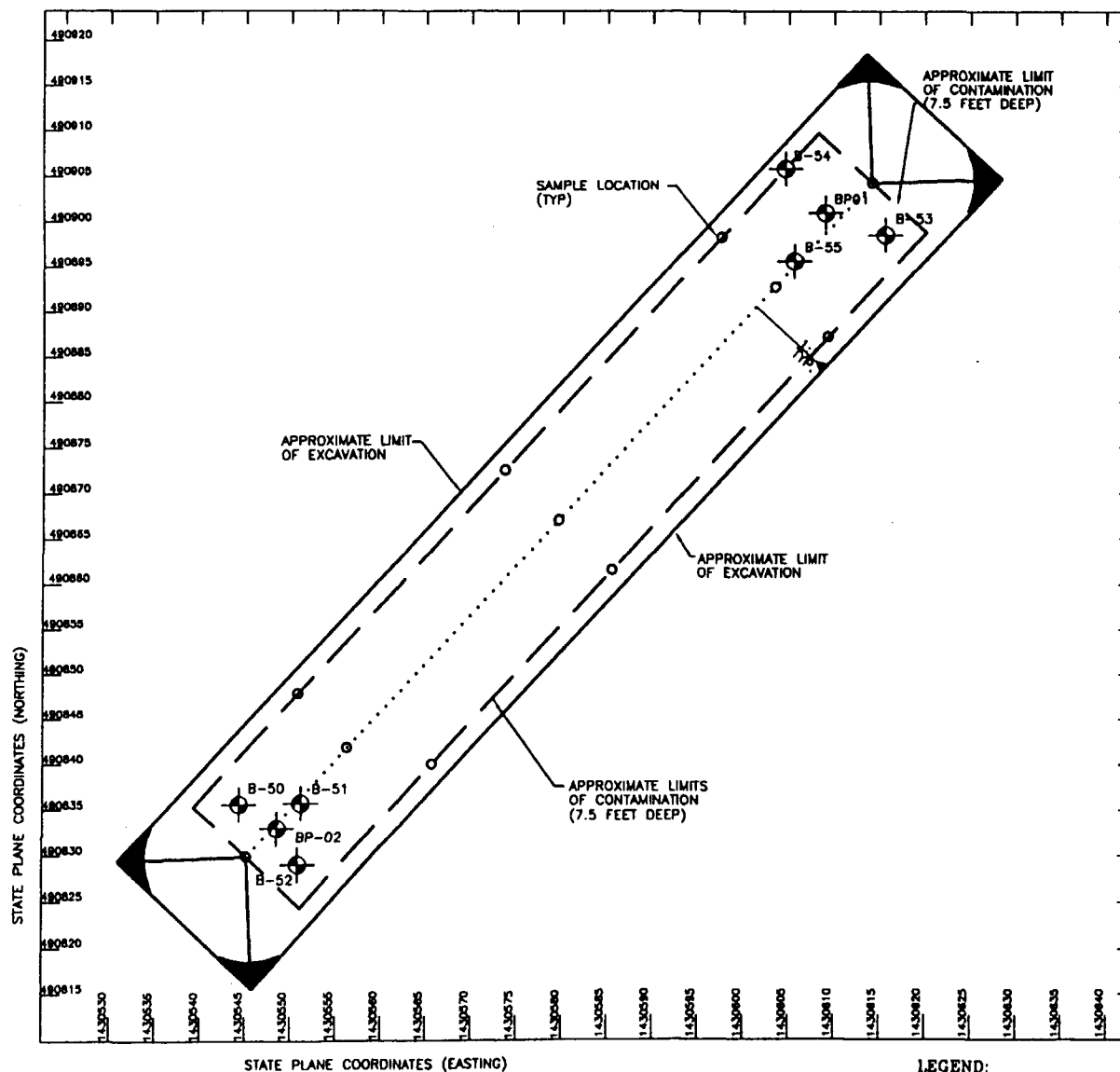
7.0 REPORTING

Data Reports will be prepared during the RA activities. These reports will contain the results of data collected during the field activities; potentiometric surface maps; and a comparison of the analytical results to the baseline conditions. These reports will be submitted to the U.S. EPA for their review and comment.



NOTE: THIS CAD DRAWING IS SET UP IN AUTOCAD'S PAPERSPACE ALTERATIONS

VDFF PRP GROUP (C:\PROJ\72680.800\VDFF.PRX) 1/1/96



LEGEND:

- SAMPLE LOCATIONS
- 10 FOOT EXCAVATION LINE



Skinner PRP Group

Skinner RA WP

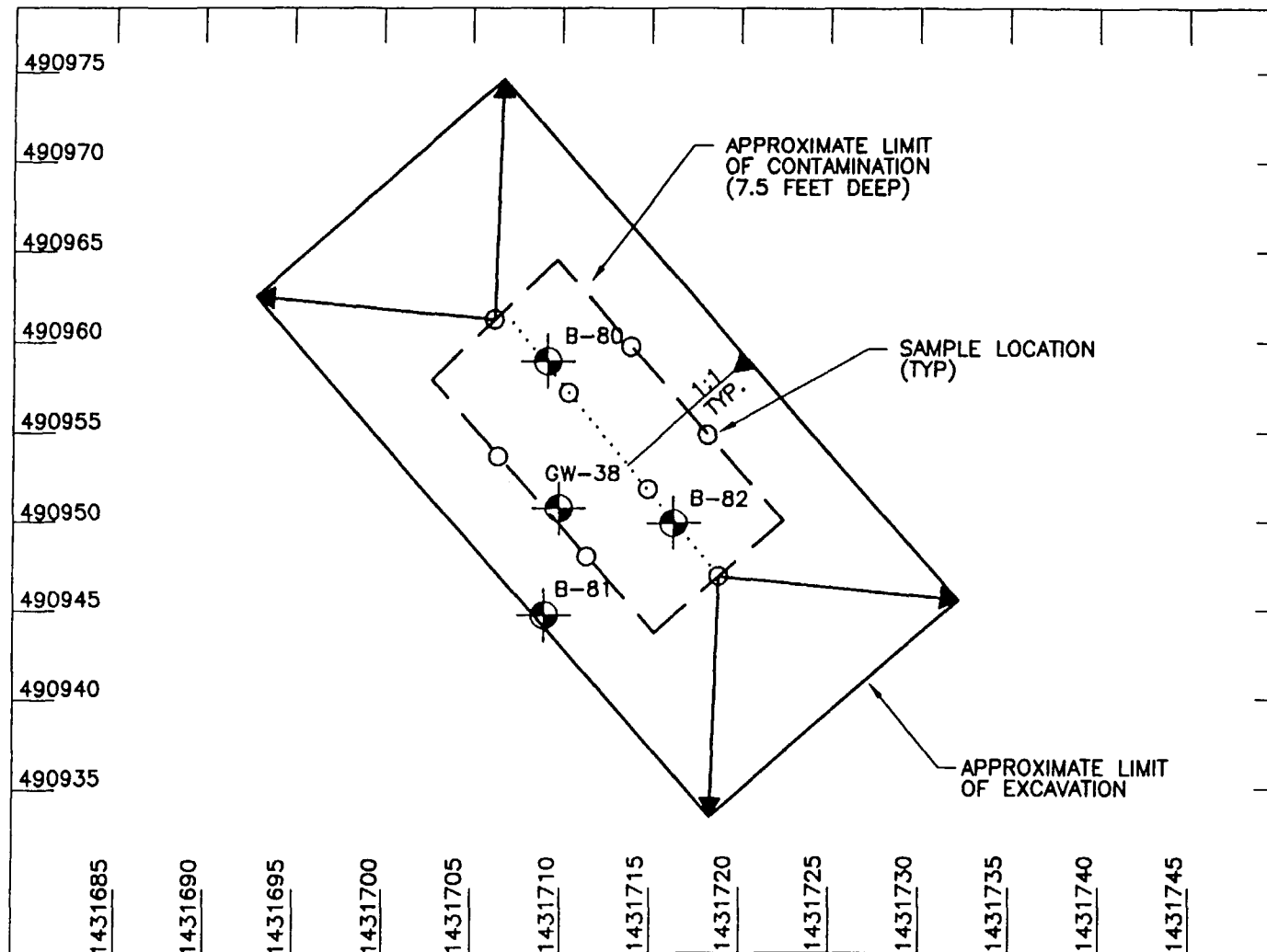
West Chester, Ohio

CONTAMINATED SOIL LIMITS- AREA BP01/BP02

RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT NO. 72680.300 FIGURE 2

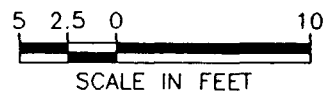
STATE PLANE COORDINATES (NORTHING)



STATE PLANE COORDINATES (EASTING)

LEGEND:

- SAMPLE LOCATIONS
- 10 FOOT EXCAVATION LINE



Skinner PRP Group

Skinner RA WP

West Chester, Ohio

CONTAMINATED SOIL LIMITS-AREA GW-38

RUST ENVIRONMENT & INFRASTRUCTURE

PROJECT NO. 72680.300 FIGURE 3

Tables

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TABLE 1

SKINNER LANDFILL REMEDIAL ACTION
MONITORING WELLS TO BE ABANDONED

Monitoring Wells to be Abandoned			
B-5	GW-17	GW-28	GW-50
B-8	GW-18	GW-29	GW-51
GW-9	GW-19	GW-31	GW-52
GW-10	GW-20	GW-32	GW-53
GW-11	GW-21	GW-33	GW-54
GW-12	GW-23	GW-35	GW-55
GW-14	GW-25	GW-36	GW-56
GW-15	GW-27	GW-38	GW-57

TABLE 2

SKINNER LANDFILL REMEDIAL ACTION
NEW GROUNDWATER MONITORING WELLS

Well Designator	Sampling Activity
GW-58	Groundwater Sampling
GW-59	Groundwater Sampling
GW-60	Groundwater Sampling
GW-61	Groundwater Sampling
GW-62A	Groundwater Sampling
GW-62B	Groundwater Sampling
GW-63	Groundwater Sampling
GW-64	Groundwater Sampling
GW-65	Groundwater Sampling
GW-66	Monitoring for DNAPLs

TABLE 3

SKINNER LANDFILL REMEDIAL ACTION
SAMPLING AND ANALYSIS PROGRAM SUMMARY

Sample Matrix (1)	No. of Samples	Field Dups. (2)	Field Blanks (2)	MS/MSD (3)	Trip Blanks (4)	Total Samples	Test Parameters (5)
Soil	19	2	2	1	-	24	TCL PCBs, TCL PAHs, and TAL Lead. See Table 7 for parameters.
Re-evaluate/Confirm Baseline Surface Water Conditions (at SW-50, SW-51, SW- 52 & SW-53) unfiltered (7)	4	1	1	1	1	8	See Tables 8 and 9 for parameters.
RA Construction Surface Water Monitoring, at SW-50, SW-51, SW-52, SW-53, & SW-54) unfiltered (6)	5	1	1	1	1	9	See Tables 8 and 9 for parameters.
Surface Water Run-off Monitoring unfiltered (6)	3	1	1	1	1	7	See Tables 8 and 9 for parameters.
Re-evaluate/Confirm Baseline Groundwater Monitoring Conditions, metals filtered and unfiltered (7)	11	2	2	1	1	17	See Tables 8 and 9 for parameters.

- Notes:
- (1) All samples are considered low/medium environmental samples.
 - (2) For surface water and run-off sampling, one field duplicate and one field blank will be collected during each sampling event. For other sampling, one field duplicate and one field blank will be collected every 10 or fewer investigative samples.
 - (3) MS/MSD consists of extra volume collected for one of the investigative samples. They will be collected at the rate of one for each surface water and out-fall sampling event and at the rate of one for every 20 or fewer investigative samples for other media. (Triple ADDITIONAL volume for VOCs, double ADDITIONAL volume for SVOCs). Laboratory duplicate analysis must be performed on an aliquot from the original one liter (1L) investigative sample container; no extra volume is required.
 - (4) One trip blank will be included with each shipment of aqueous VOC samples.
 - (5) Field parameters will be collected for aqueous samples and may include temperature, pH, specific conductance, and dissolved oxygen.
 - (6) Surface water run-off sampling will be done weekly until completion of the RA cover and trench/cut-off wall system construction activities. Samples listed are per sampling event. Run-off samples will only be collected after a rain event.
 - (7) Surface water and groundwater samples will be collected at selected sample locations at the end of the RA construction activities to re-evaluate and confirm the baseline conditions defined during the GWDI.

TABLE 4

SKINNER LANDFILL REMEDIAL ACTION
PROPOSED MONITOR WELL AND PIEZOMETER
SCREENED INTERVALS

Monitoring Well or Piezometer	Depth to Bottom of Well or Piezometer (ft)	Screened Length (ft)	Target Interval
GW-58	13	10	Sand and gravel
GW-59	12	10	Sand and gravel
GW-60	12	10	Sand gravel, bottom of trench, bedrock - sediment interface
GW-61	19	10	Sand, bottom of trench
GW-62A	15	10	Sand, bottom of trench
GW-62B	24	10	Bedrock - sediment interface
GW-63	19	10	Sand, bedrock - sediment interface
GW-64	13	10	Sand, bedrock - sediment interface
GW-65	14	10	Bedrock - sediment interface
GW-66	29	10	Bedrock - sediment interface
P-1	19	10	Sand and gravel, bottom of trench
P-2	17	10	Bedrock - sediment, interface
P-3	14	10	Sand
P-4	18	10	Sand, bedrock - sediment interface
P-5	13	10	Bedrock - sediment interface
P-6	40	15	Bottom of waste/Groundwater interface
P-7	40	15	Groundwater interface
P-8	40	15	Groundwater interface
P-9	40	15	Groundwater interface
P-10	40	15	Groundwater interface
P-11	55	15	Groundwater interface
P-12	50	15	Groundwater interface

TABLE 5

SKINNER LANDFILL REMEDIAL DESIGN
WATER SAMPLE BOTTLES, PRESERVATION AND TECHNICAL HOLDING TIMES

Parameters	Container	Preservative	Technical Holding Time	Amount
TCL Volatiles	40 mL VOA vials	HCl to pH<2	10 days	2 x 40 mL
TCL Semi-volatiles	1 L amber glass	Cool, 4 degrees C	5 days to extraction 40 days to analysis	2 x 1 L
TCL Pesticides/PCBs	1 L amber glass	Cool, 4 degrees C	5 days to extraction 40 days to analysis	2 x 1 L
TAL Inorganics (unfiltered/filtered)	1 L polyethylene	HCl to pH<2	180 days (except mercury 26 days)	1 L
TAL Cyanide	1 L polyethylene	NaOH to pH>12	12 days	1 L
Dissolved Oxygen - 4500-OG	1 L polyethylene	Cool, 4 degrees C	24 hours	1 L
BOD - EPA 405.1	1 L polyethylene	Cool, 4 degrees C	48 hours	1 L
COD - EPA 410.4	1 L polyethylene	H ₂ SO ₄ to pH<2	28 days	1 L
TSS - EPA 160.2	1 L polyethylene	Cool, 4 degrees C	7 days	1 L
Oil & Grease - EPA 413.1	1 L amber glass	H ₂ SO ₄ to pH<2	28 days	1 L
Ammonia Nitrogen - EPA 350.1	1 L amber glass	H ₂ SO ₄ to pH<2	28 days	1 L
TDS - EPA 160.1	250 ml polyethylene	Cool, 4 degrees C	7 days	250 mL

TABLE 6

SKINNER LANDFILL REMEDIAL ACTION
SOIL SAMPLE BOTTLES, PRESERVATION AND TECHNICAL HOLDING TIMES

Parameters	Container	Preservative	Technical Holding Time	Amount
TCL Semi-volatiles	8 oz clear glass	Cool, 4 degrees C	5 days to extraction 40 days to analysis	8 oz
TCL Pesticides/PCBs	8 oz clear glass	Cool, 4 degrees C	5 days to extraction 40 days to analysis	8 oz
TAL Inorganics - Lead	8 oz clear glass	Cool, 4 degrees C	180 days	8 oz

TABLE 7

SKINNER LANDFILL REMEDIAL ACTION
PARAMETERS AND REMEDIAL TRIGGER LEVELS FOR
CONTAMINATED SOILS EXCAVATION

CONTAMINANT	CONCENTRATION (mg/Kg) (1)
Polychlorinated Biphenyls - Total	0.160
Benzo(a)anthracene	0.330
Benzo(a)pyrene	0.100
Benzo(b)fluoranthene	0.330
Benzo(k)fluoranthene	0.330
Chrysene	0.330
Lead	500.0

- (1) The concentrations shown in this table are not detection limits. CRQLs for these parameters are shown in Tables 8 through 11.
Analytical Method: CLP SOW OLMO1.8

TABLE 8

SKINNER LANDFILL REMEDIAL DESIGN
TARGET COMPOUND LIST VOLATILES AND
CONTRACT REQUIRED QUANTITATION LIMITS

		Quantitation Limits
Volatiles	CAS Number	Water (ug/L)
1. Vinyl Chloride	75-01-4	10
2. 1,2-Dichloroethene (total) (1)	540-59-0	10
3. Chloroform	67-66-3	10
4. 1,2-Dichloroethane	107-06-2	10
5. 2-Butanone	78-93-3	10
6. 1,1,1-Trichloroethane	71-55-6	10
7. Carbon Tetrachloride	56-23-5	10
8. 1,2-Dichloropropane	78-87-5	10
9. Trichloroethene	79-01-6	10
10. 1,1,2-Trichloroethane	79-00-5	10
11. Benzene	71-43-2	10
12. Tetrachloroethene	127-18-4	10
13. Toluene	108-88-3	10
14. 1,1,2,2-Tetrachloroethane	79-34-5	10
15. Chlorobenzene	108-90-7	10
16. Ethyl benzene	100-41-4	10
17. Styrene	100-42-5	10
18. Xylenes (total)	1330-20-7	10

(1) Table 2 reports 1,2 - Dichloroethene (total) as 1,2 - Dichloroethene (cis) and 1,2 - Dichloroethene (trans).

TABLE 9

SKINNER LANDFILL REMEDIAL DESIGN
TARGET COMPOUND LIST SEMI-VOLATILES AND
CONTRACT REQUIRED QUANTITATION LIMITS

Semi-volatiles (2)	CAS Number	Quantitation Limits	
		Water (ug/L)	Soil/Sediment (mg/Kg) (1)
1. Phenol	108-95-2	10	330
2. bis(2-Chloroethyl) ether	111-44-4	10	330
3. 1,3-Dichlorobenzene	541-73-1	10	330
4. 1,4-Dichlorobenzene	106-46-7	10	330
5. 1,2-Dichlorobenzene	95-50-1	10	330
6. 2,2'-oxybis-(1-Chloropropane) (3)	108-60-1	10	330
7. Hexachloroethane	67-72-1	10	330
8. Nitrobenzene	98-95-3	10	330
9. Isophorone	78-59-1	10	330
10. 2,4-Dimethylphenol	105-67-9	10	333
11. 1,2,4-Trichlorobenzene	120-82-1	10	330
12. Naphthalene	91-20-3	10	330
13. Dimethylphthalate	131-11-3	10	330
14. Acenaphthene	83-32-9	10	330
15. 4-Nitrophenol	100-02-7	25	800
16. Phenanthrene	85-01-8	10	330
17. Di-n-butyl phthalate	86-74-2	10	330
18. Fluoranthene	206-44-0	10	330
19. Butyl benzyl phthalate	85-68-7	10	330
<u>20. Benzo(a)anthracene</u>	56-55-3	10	333
<u>21. Chrysene</u>	218-01-9	10	330
22. bis(2-Ethylhexyl)phthalate	117-81-7	10	330
<u>23. Benzo(b)fluoranthene</u>	205-99-2	10	330
<u>24. Benzo(k)fluoranthene</u>	207-08-9	10	330
<u>25. Benzo(a)pyrene</u>	50-32-8	10	330
26. Indeno(1,2,3-cd)pyrene	193-39-5	10	330
27. Dibenzo(a,h)anthracene	53-70-3	10	330
28. Benzo(g,h,i)perylene	191-24-2	10	330

- (1) Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the protocol, will be higher.
- (2) Underline parameters are the site specific parameters of interest defined in the ROD and RD SOW as listed in Table 3.
- (3) Previously known by the name bis(2-Chloroisopropyl) ether.

TABLE 10

SKINNER LANDFILL REMEDIAL DESIGN
TARGET COMPOUND LIST PESTICIDES & PCBs AND
CONTRACT REQUIRED QUANTITATION LIMITS

		Quantitation Limits	
Pesticides/Aroclors	CAS Number	Water (ug/L)	Soil/Sediment (mg/Kg) (1)
1. AROCLOR-1016	12674-11-2	1.0	33.0
2. AROCLOR-1221	11104-28-2	0.5	67.0
3. AROCLOR-1232	11141-16-5	0.5	33.0
4. AROCLOR-1242	53469-21-9	1.0	33.0
5. AROCLOR-1248	12672-29-6	1.0	33.0
6. AROCLOR-1254	11097-69-1	1.0	33.0
7. AROCLOR-1260	11096-82-5	1.0	33.0

(1) Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the protocol, will be higher.

TABLE 11

SKINNER LANDFILL REMEDIAL DESIGN
TARGET ANALYTE LIST INORGANICS AND
CONTRACT REQUIRED QUANTITATION LIMITS

Analyte (4)	Contract Required (1, 2, 3) Quantitation Limit (ug/L)
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Chromium	10
Copper	25
Iron	100
<u>Lead</u>	3
Mercury	0.2
Nickel	40
Selenium	5
Silver	10
Thallium	10
Zinc	20
Cyanide	10

- (1) Higher detection limits may only be used if the sample concentration exceeds five times the detection limit of the instrument or method in use. The value may be reported even though the instrument or method detection limit may not equal the CRQL. This is illustrated in the example where the value of 220 may be reported even though the instrument detection limit is greater than the CRQL.

For lead: Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample Concentration = 220
CRQL = 3

- (2) The CRQL's are the instrument detection limits obtained in pure water. The detection limits for samples may be considerably higher depending on the sample matrix.
- (3) The CRQL's for soils = 200 times CRQL's for water.
- (4) Underlined parameter is the site specific parameter of interest defined in the ROD and RD SOW as listed in Table 3.

TABLE 12

SKINNER LANDFILL REMEDIAL ACTION
ADDITIONAL SURFACE WATER PARAMETERS
AND CONTRACT REQUIRED QUANTITATION LIMITS

PARAMETER	ANALYTICAL METHOD	DETECTION LIMIT (mg/L)
Biochemical Oxygen Demand	EPA 405.1	3.0
Ammonia Nitrogen	EPA 350.1	0.05
Total Dissolved Solids	EPA 160.1	10.0
Total Suspended Solids	EPA 160.2	1.0
Oils and Grease	EPA 413.1	1.0

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APPENDIX I

RUST STANDARD OPERATING PROCEDURES

APPENDIX I

SOP TABLE OF CONTENTS

SOP-1	Well Purging
SOP-2	Groundwater Sampling
SOP-3	Containment and Disposal of Investigation Derived Waste
SOP-4	Standard Operating Procedure for the Measurement of Temperature in Water
SOP-5	Standard Operating Procedure for the Field Measurement of pH in Water
SOP-6	Standard Operating Procedure for the Field Measurement of Conductivity in Water
SOP-7	Standard Operating Procedure for the Measurement of Dissolved Oxygen in Water
SOP-8	Surface Water Sampling
SOP-9	Soil Sampling from Excavations
SOP-10	Biological Monitoring

1.0 PURPOSE

The purpose of this procedure is to provide general reference information on well purging by the pumping method prior to the sampling of groundwater wells. The methods and equipment described are for the purging of water samples from the saturated zone of the subsurface.

2.0 SCOPE

This procedure applies to purging relatively large volumes of water in shallow to medium depth wells.

3.0 REQUIREMENTS

Methods for purging from completed wells include the use of pumps, compressed air, bailers, and various types of samplers. The primary considerations in obtaining a representative sample of the groundwater are to avoid collection of stagnant (standing) water in the well and to avoid physical or chemical alteration of the water due to sampling techniques. In a non-pumping well, there will be little or no vertical mixing of water in the well pipe or casing, and stratification will occur. The well water in the screened section will mix with the groundwater due to normal flow patterns, but the well water above the screened section will remain isolated and become stagnant.

4.0 REFERENCES

- 4.1 United States Environmental Protection Agency, 1989. *Groundwater Handbook*: EPA/625/6-87/016.

5.0 DEFINITIONS

None.

6.0 RESPONSIBILITIES

6.1 Project Manager

The Project Manager is responsible for reviewing the purging procedures used by the field crew and for performing in-field spot checks for proper purging procedures.

6.2 Site Geologist

The Site Geologist is primarily responsible for the proper well purging techniques. The Geologist will be responsible for purging of wells, performing necessary physical measurements and observations, and containment of purged water. He must record pertinent information including amount of water purged, pH, specific conductivity, temperature, and turbidity in the Field Log Book.

7.0 EQUIPMENT

1. Purge pump.
2. Power source.
3. Steel retractable engineer's measuring tape (Calibrated to 0.01 foot)
4. Water level indicators.
5. Swabbing equipment (as necessary).
6. pH meter.
7. Specific conductance meter.
8. Thermometer.
9. HNu photoionization detector.
10. Containers for the development water.
11. Field log book.

8.0 PROCEDURE

8.1 General

- o The amount of flushing a well should receive prior to sample collection will depend on the intent of the monitoring program and the hydrogeologic conditions.
- o For the volumetric method, generally three well volumes are considered effective for purging a well.
- o An alternative method of purging a well is to purge continuously (using a low volume low flow pump) while monitoring specific conductance, pH, and water temperature until the values stabilize.

8.2 Calculations of Well Volume

To insure that the proper volume of water has been removed from the well prior to sampling it is first necessary to determine the volume of standing water in the well pipe and the volume of water in the filter pack below the well seal. The volume can be easily calculated by the following method. Calculations shall be entered in the field logbook:

1. Obtain all available information on well construction (location, casing, screens, etc.).
2. Determine well or casing and diameter.
3. Measure and record static water level (Depth below ground level or top of casing reference point).
4. Determine depth of well.

5. Calculate number of linear feet of static water (total depth or length of well pipe minus the depth to static water level).
6. Calculate the volume of water in the casing.

$$V_t = \pi (di/2)^2 (TD-H) (7.48)$$

Where:

$$\pi = 3.14$$

V_t = Total volume, gal

di = inside diameter of casing, ft

TD = total depth of well, ft

H = depth to water, ft, from ground surface

7. Determine the minimum number of volumes to be evacuated before sampling.

8.3 Well Purging by Pumping

- o Lower the purge pump into the well until it is submerged. NOTE!!: If resistance is encountered when lowering the pump into the well, WITHDRAW THE PUMP FROM THE WELL and inform the Field Team Leader.
- o Direct the pump discharge hose into the receptor bucket and start the pump in accordance with the manufacturer's operations manual.
- o Record total volume of water removed.
- o Collect at least three samples during purging and measure physical parameters including pH, conductivity, temperature, and turbidity.
- o Whenever the receptor bucket is full, dispose of the purge water in accordance with the procedures specified in the IRM QAPP for the Skinner Landfill.
- o Purging will continue until the required volume of water has been removed and the physical parameters have stabilized so that pH is ± 0.1 su, conductivity ± 10 umhos, temperature is $\pm 1^\circ\text{C}$, within three successive intervals.
- o Decontaminate the bailers per the project-specific work plan.

8.4 Purge Water Containment and Disposal

Purge water will be contained and disposed as detailed in SOP-5.

9.0 ATTACHMENTS

None.

1.0 PURPOSE

The purpose of this procedure is to obtain groundwater samples that are representative of the source from which they are taken and minimize sampler exposure to groundwater contaminants. The methods and equipment described are for the collection of water samples from the saturated zone of the substrata.

2.0 SCOPE

This procedure provides information on proper equipment and techniques for groundwater sampling. Review of the information contained herein will facilitate planning of the field sampling effort by describing standard sampling techniques. The techniques described should be followed whenever applicable, noting that site-specific conditions or project-specific work plans may require adjustments in methodology.

3.0 REQUIREMENTS

Generally, wells should be sampled within three hours of purging. However, wells with poor recharge should be sampled within 24 hours of purging. Poor recharge wells are those that cannot recharge 80% of the original volume within 8 hours.

Applicable preservatives must be added to the sample containers before the samples are collected.

4.0 REFERENCES

- 4.1 ASTM, 1986. *Annual Book of ASTM Standards*, Section 11. Volume 11.04, D4448-85A.
- 4.2 Barcelona, M.J., J.P. Gibb and R.A. Miller, 1983. *A Guide to the Selection of Materials for Monitoring Well Construction and Groundwater Sampling*, ISWS Contract Report 327, Illinois State Water Survey, Champaign, IL.
- 4.3 Johnson Division, UOP, Inc., 1975. *Groundwater and Wells, A Reference Book for the Water Well Industry*. Johnson Division, UOP, Inc., Saint Paul, MN.
- 4.4 Nielson, D.M. and G.L. Yeates, 1985. *A Comparison of Sampling Mechanisms Available for Small-Diameter Groundwater Monitoring Wells*. Groundwater Monitoring Review 5:38-98.
- 4.5 Scalf, M.R., J.F. McNabb, W.J. Dunlapp, R.L. Crosby and J. Fryberger, 1981. *Manual of Groundwater Sampling Procedures*. R.S. Kerr Environmental Research Laboratory, Office of Research and Development, USEPA, Ada, OK.

4.6 USEPA, 1980. *Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities*. Office of Solid Waste, United States Environmental Protection Agency, Washington, D.C.

4.7 USEPA, 1986. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, EPA SW-846.

4.8 USEPA, 1987. *Groundwater Handbook*, EPA/625/6-87/016.

4.9 USEPA, 1987. *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001.

5.0 DEFINITIONS

None.

6.0 RESPONSIBILITIES

6.1 Project Manager

Responsible for reviewing the sampling procedures used by the field crew and for performing in-field spot checks for proper sampling procedures.

6.2 Site Geologist

The Site Geologist is primarily responsible for the proper acquisition of the groundwater samples.

7.0 EQUIPMENT

Sample containers shall conform with U.S. EPA regulations for preservation of appropriate contaminants.

Ideally, sampling equipment should be completely inert, economical, easily decontaminated, easily sterilized, reusable, able to operate at remote sites in the absence of power sources, and capable of delivering variable rates for well flushing and sample collection. The sample withdrawal equipment (evacuation devices) to be used on this project are submersible pumps. Other equipment to be used include:

1. Sample Packing and Shipping Equipment.
2. Coolers for sample shipping and cooling.
3. Chemical preservatives.
4. Appropriate packing cartons and filler.
5. Labels.
6. Chain-of-custody documents.
7. Thermometer.

8. pH meter.
9. Portable HNu photoionization detector.
10. Specific conductivity meter.
11. Water-level indicator.
12. Flow meter.
13. Field sampling logbooks.
14. Pails.
15. Gamma and Beta Radiation Detector.

8.0 PROCEDURE

8.1 General

To be useful and accurate, a groundwater sample must be representative of the particular saturated zone of the substrata being sampled. The physical, chemical and bacteriological integrity of the sample must be maintained from the time of sampling to the time of testing in order to keep any changes in water quality parameters to a minimum.

The groundwater sampling program should be developed with reference to ASTM D4448-85A, Standard Guide for Sampling Groundwater Monitoring Wells. The ASTM guide is not intended as a monitoring plan or procedure for a specific application, but rather as a review of methods. The primary considerations in obtaining a representative sample of the groundwater are to avoid collection of stagnant (standing) water in the well, and to avoid physical or chemical alteration of the water due to sampling techniques. In a non-pumping well, there will be little or no vertical mixing of water in the well pipe or casing. Stratification may occur. The well water in the screened section will mix with the groundwater due to normal flow patterns, but the well water above the screened section will remain isolated and become stagnant. To safeguard against collecting non-representative stagnant water in a sample, the following approach should be followed during sample withdrawal:

1. All monitoring wells shall be purged prior to withdrawing a sample. Evacuation of three volumes is recommended for a representative sample. Purge water will be contained and disposed as detailed in SOP-5.
2. For wells that can be purged dry, the wells should be evacuated and allowed to recover prior to sample withdrawal.
3. For high-yield monitoring wells which cannot be evacuated to dryness, there is no absolute safeguard against contaminating the sample with stagnant water. The use of a pump and certain techniques of sample withdrawal may minimize this possibility.

Stratification of contaminants may exist in the groundwater either in terms of concentration gradients as a result of mixing and dispersion processes in a homogeneous layer, or due to layers of variable permeability into which a greater or lesser amount of the contaminant plume has flowed.

Excessive pumping can dilute or increase the contaminant concentrations in the recovered sample compared to what is representative of the integrated water column at that point. This can result in the collection of a non-representative sample. Water produced during purging shall be collected, stored or treated and discharged as allowed. Purge water will be disposed in accordance with the procedures specified in the IRM QAPP for Skinner Landfill.

8.2 Calculations of Well Volume

To ensure that the proper volume of water has been removed from the well prior to sampling, it is first necessary to determine the volume of standing water in the well casing and the volume of water in the filter pack below the well seal. The volume can be easily calculated by the following method. Calculations should be entered into the field logbook:

1. Obtain the available information on well construction (location, casing, screens, etc.).
2. Determine well or casing diameter.
3. Measure and record static water level (depth below ground level or top of casing reference point).
4. Determine depth of well.
5. Calculate number of linear feet of static water (total depth or length of well casing minus the depth to static water level).
6. Calculate the volume of water in the casing.

$$V_t = \pi (d_i/2)^2 (TD-H)(7.48)$$

Where,

$$\pi = 3.14$$

V_t = Total volume, gal

d_i = inside diameter of casing, ft

TD = total depth of well, ft

H = depth to water, ft, from ground surface

P =

7. Determine the minimum number of volumes to be evacuated before sampling.

8.3 General

The amount of flushing a well should receive prior to sample collection will depend on the intent of the monitoring program and the hydrogeologic conditions.

For defining a contaminant plume, a representative sample of only a small volume of the aquifer is required. These circumstances require that the well be pumped sufficiently to remove the stagnant water but not long enough to induce significant groundwater.

8.4 Sampling

8.4.1 Sampling Methods

The collection of a groundwater sample is made up of the following steps.

1. Record the sample location, site, anticipated sample time, and field sample number using a indelible pen. Fill out sample labels for each of the required sample containers and place labels onto the appropriate sample containers. Labels must be waterproof to prevent water damage. The following information may be included on the sample label:
 - o site name;
 - o field identification or sample station number;
 - o date and time of sample collection;
 - o type of sample (matrix) and a brief description of the sampling location;
 - o printed full name of the sampler;
 - o sample preservative used; and
 - o types of analyses to be performed.

If a sample is split with another party, sample labels with identical information should be attached to each of the sample containers.

2. Open the well cover and use volatile organic detection meter (HNU) to monitor the escaping gases at the well head to determine the need for respiratory protection.
3. Sound the well for total depth and water level (using decontaminated equipment) and record these data in the field logbook. Calculate the fluid volume in the well.
4. Calculate depth from the casing top to the midpoint of the screen or well section open to the aquifer. Any dry wells encountered must be noted.
5. In the event that recovery time of the well is very slow (e.g., 24 hours), sample collection may be delayed until the following day. If the well has been purged early in the morning, sufficient water may be standing in the well by the day's end to permit sample collection. If the well is incapable of producing a sufficient volume of sample at any time, take the largest quantity available and record in the logbook.
6. To ensure that groundwater samples are representative of actual conditions, samplers must work efficiently to minimize the loss of groundwater contaminants and the introduction of foreign contaminants. To prevent contamination of samples, the sample bottles should be opened only when receiving sample preservatives or groundwater samples and closed immediately afterwards.

The sampler should quickly add the sample into the sample containers, while minimizing aeration and loss of volatile contaminants. Samples collected for analysis of volatile constituents will be collected first, followed by samples collected for analysis of SVOCS, pesticides/PCBs, metals, and cyanide. Additional water from the well will be divided among the remaining sample bottles. For analysis that requires filtered samples, it is preferred that the samples be allowed to settle in a separate sample container, followed by decanting and then filtration. Field filtration may also be accomplished using an in-line filter. Consult the specific analytical procedure for details. Large volume samples for extractable organic compounds, total metals, etc., should be collected last.

When a sample bottle is filled, the bottle must be tightly capped as soon as possible.

7. Efficiency and care must be utilized to obtain representative samples for volatile organic analysis. Unnecessary delays or poor sampling technique will lead to loss of the volatile constituents from the sample.

Add the required preservatives to the sample containers immediately prior to or after collecting the sample, label all containers and stage the collection setup before collecting the sample to minimize sampling time.

Prevent unnecessary stripping of volatile constituents from the sample by minimizing turbulence and aeration when filling the sample container. Quickly fill the sample container until a positive meniscus is achieved above the rim of the container and cover the container immediately. Gently tap the sample container to dislodge any air bubbles and verify that no bubbles are present. If bubbles are detected, immediately uncapped the sample, add additional sample from the bailer until a positive meniscus is reestablished, immediately recapped the sample and check the sample for bubbles. Repeat this step until the sample contains no bubbles and all required samples are obtained.

8. After sampling, replace the well cover.
9. As soon as all samples are collected, promptly prepare the samples for shipment in accordance with the FSP, and store the samples collected for volatile organic analysis in a cooler with pre-packaged ice. Attach a custody seal to the shipping package as described in the FSP. Make sure that the chain-of-custody forms are properly filled out and enclosed or attached.
10. Record all sampling information in the field log book.
11. Decontaminate all equipment.

8.4.2 Sample Containers

Use the laboratory-supplied sample containers which are pre-cleaned and appropriate for the analytical method for which you are sampling.

8.4.3 Preservation of Samples and Sample Volume Requirements

Sample preservation techniques and volume requirements depend on the type and concentration of the contaminant and on the type of analysis to be performed. The Skinner Landfill QAPP describes the sample preservation and volume requirements for the chemicals that will be analyzed.

8.4.4 Field Filtration

All filtration must occur in the field immediately upon collection. Filters must be pre-rinsed with organic-free water.

Samples for organic analyses must never be filtered.

8.4.5 Handling and Transporting Samples

After collection, samples should be handled as little as possible. It is preferable to use self-contained "chemical" ice (e.g., "blue ice") to reduce the risk of contamination. If natural ice is used, it should be bagged and steps taken to ensure that the melted ice does not cause sample containers to be submerged and possibly cross-contaminated. All sample containers should be enclosed in plastic bags or cans to prevent cross-contamination. Samples should be secured in the ice chest to prevent movement of sample containers and possible breakage.

8.4.6 Sample Holding Times

Holding times (i.e., allowed time between sample collection and analysis) for routine samples are given in Table 6.

8.5 Records

Records will be maintained for each sample that is taken. Record the following information:

*

- o Sample identification (site name, location, project number; sample name/number and location; sample type and matrix; time and date; sampler's identity).
- o Sample source and source description.
- o Field observations and measurements (appearance; volatile screening; field chemistry; sampling method).
- o Sample disposition (analyses to be run; number and size of bottles; preservatives added).

- o Additional remarks - (e.g., sampled in conjunction with regulatory authorities; samples for specific conductance value only; samples for key indicator; etc.).

9.0 ATTACHMENTS

None.

1.0 PURPOSE

The purpose of this procedure is to define the methods to be followed to contain and dispose of Investigation Derived Wastes (IDW) to prevent runoff from IDW from impacting any surface waters.

2.0 SCOPE

Investigation Derived Waste will be generated during purging of monitoring wells for development and for sampling, during decontamination procedures occurring on site, and during drilling operations. This SOP should be consulted during any of the above procedures to ensure that the proper precautions are taken.

3.0 REQUIREMENTS

It is important to ensure that the surface waters located on and near the site are not impacted by Investigation Derived Waste.

4.0 REFERENCES

None.

5.0 DEFINITIONS

None.

6.0 RESPONSIBILITIES

6.1 Field Team Leader

The Field Team Leader is primarily responsible for ensuring that the proper procedures are followed to contain and dispose of Investigation Derived Waste. He is responsible for training the field personnel in the proper procedures for the individual tasks.

6.2 Field Geologist

The Field Geologist will be responsible for documenting the disposition of all Investigation derived waste in the field logbook.

7.0 EQUIPMENT

1. Drums.
2. Other containers as appropriate.

3. Personnel protective equipment as needed.

8.0 PROCEDURE

Three field procedures are expected to generate Investigation Derived Waste; purging and development of monitoring wells, decontamination of field equipment, and drilling operations.

8.1 Purge and Development Fluids

Prior to emplacement of the landfill cap, fluids generated during purging or development of monitoring wells will be containerized at the well site transported to the top of the landfill and deposited on the ground surface of the landfill (see Figure 2). Any fluids generated after cap emplacement will be containerized for off-site disposal.

8.2 Decontamination Water

The decontamination zone will be located on top of the landfill. Heavy equipment will be decontaminated there. Bailers, split spoons and other small sampling devices may be decontaminated at the work site as long as the decontamination water is containerized, transported to the decontamination zone and deposited on the ground surface of the landfill. Decontamination fluids generated after the emplacement of the landfill cap will be containerized for off-site disposal.

8.3 Drill Cuttings

Drill cuttings will be drummed at the drill site and transported to the drum storage area located on top of the landfill. The drummed waste will later be incorporated beneath the cover during the RD.

9.0 ATTACHMENTS

None.

1.0 Title: Standard Operating Procedure for the Measurement of Temperature in Water**2.0 Location**

This SOP may be used anywhere on or off the Skinner site as long as the requirements of the SOP are met.

3.0 Purpose

This SOP will be used to measure the temperature of influent, effluent, groundwater, and surface water samples.

4.0 Scope

This SOP describes the calibration check and use of an alcohol, bimetallic, or electronic thermometer to measure the temperature of influent, effluent, groundwater, and surface water samples. A thermometer which is properly calibrated may also be used to indicate ambient temperature.

5.0 References

5.1 Waste Management, Inc. Manual for Groundwater Sampling.

6.0 Sample Handling and Preservation

Temperature measurements must be made in-situ, or as soon as possible after a portion of the sample is transferred to a beaker, to avoid temperature changes due to environmental factors.

7.0 Apparatus and Materials

1. alcohol, bimetallic, or electronic thermometer with a range of at least 0 °C to 100°C, with at least 0.1°C intervals
2. ice bath
3. boiling water bath
4. small (100-200 ml) beakers
5. Chemwipes or equivalent

8.0 Analytical Procedures

1. Ensure that the thermometer calibration has been checked within 30 days of use. If not, suspend the sensing probe of the thermometer directly into an ice bath which has been equilibrating for at least 5 minutes. If the thermometer reads $0 \pm 1^{\circ}\text{C}$, record 0.0°C . If the calibration check was satisfactory, complete the calibration check by signing and dating the record.
2. Suspend the sensing probe directly into the sample, or into a portion of the sample which has been collected in a small beaker. Ensure that the probe does not contact anything other than the sample medium.
3. Allow the thermometer to stabilize, and then record the temperature.
4. Remove the thermometer and wipe dry.

9.0 Quality Control

Calibration data should be maintained and available for reference or inspection. The thermometer must be calibrated daily or prior to use, whichever is more frequent.

10.0 Data Analysis

Since the thermometer is a direct-reading instrument, the data is recorded directly.

11.0 Documentation

Record all measurement values.

1.0 Title: Standard Operating Procedure for the Field Measurement of pH in Water**2.0 Location**

This SOP may be used anywhere on or off the Skinner Landfill Site as long as the requirements of the SOP are met.

3.0 Purpose

This SOP will be used to measure pH of influent, effluent, groundwater, and surface water samples.

4.0 Scope

This SOP describes the use of a portable, temperature compensating pH/conductivity meter for field use. The instrument is calibrated using commercially available buffer reference solutions at or near 25°C, and the instrument reading is adjusted to equal the pH of the standard at 25°C.

5.0 References

1. "Test Methods of Evaluating Solid Wastes", Third Edition (1986), SW-846, Procedure 9040.
2. Cole Parmer Model DspH-3 Operating Instructions.

6.0 Sample Handling and Preservation

This procedure can be used to measure the pH of the water samples in-situ or in a beaker which has been triple-rinsed with distilled water and at least once with sample. If the measurement is to be made at some later time, the sample must be placed in a laboratory supplied bottle, filled to overflowing, and capped immediately to avoid dissolution of atmospheric gases. In such cases, the sample should be stored at 4 °C and analyzed within 24 hours:

Standard pH buffers should be stored below 30 degrees C to minimize the likelihood of error due to evaporation or microbial growth. The standard should be discarded if the expiration date is past, or if color, turbidity, or visible microbial growth develops.

7.0 Apparatus and Materials

1. Cole Parmer pH/Conductivity meter (DspH-3) or equivalent
2. pH 4, 7, and 10 buffer solutions
3. Distilled water

4. Small screw driver
5. Beakers (100 ml or larger)
6. Bottle labeled "waste pH buffer solution"

8.0 Analytical Procedure

1. Slide back the electrode compartment to release pH and conductivity electrodes.
2. Deploy electrodes in either the 90 or 180 degree measurement position.
3. Remove the bottom section of the protective pH probe cover.
4. Thoroughly rinse the pH probe and remaining parts of the probe cover with distilled water.
5. Energize the instrument by depressing the on/off switch once. (Ensure the instrument is in the pH mode by pressing the pH/PPM microswitch as needed).
6. Slide back the bottom compartment cover to the first stop, exposing the adjustment pots.
7. Transfer enough pH-7 buffer solution to cover at least $\frac{1}{2}$ of the pH probe into a beaker that has been either triple-rinsed with distilled water and once with the same buffer solution, or a disposable beaker that has been rinsed once with the buffer solution. Measure the buffer temperature and record. Using the attached Table, record the corresponding temperature-adjusted pH value.
8. Immerse the sensing portion of the probe at least $\frac{1}{2}$ its length into the buffer solution. Allow the reading to stabilize while slightly agitating the solution.
9. Adjust the CAL pot until the instrument indicated the correct temperature-compensated pH value.
10. Remove the probe from the test solution and rinse with distilled water.
11. Discard the used pH buffer into the collection bottle for subsequent disposal.
12. Select the appropriate pH4 or pH10 buffer solution (choice of buffers should be such that this buffer and the pH 7.0 buffer bracket the sample pH).
13. Immerse the sensing portion of the probe at least $\frac{1}{2}$ its length into the buffer solution. Allow the reading to stabilize while slightly agitating the solution.

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14. Adjust the SLOPE pot until the instrument indicates the correct temperature-compensated pH value.
 15. Remove the probe from the test solution and rinse with distilled water.
 16. Discard the used pH buffer into the collection bottle for subsequent disposal.
 17. Immerse the sensing portion of the probe at least $\frac{1}{2}$ its length into the sample. (This measurement can be made in-situ, or a portion of the sample can be transferred into a beaker that has been triple-rinsed with distilled water and once with the sample solution). Allow the reading to stabilize while slightly agitating the solution.
 18. Read the sample pH and record. (NOTE: If the sample pH is outside the range of the calibration standards, repeat the instrument calibration using the correct buffer solution prior to remeasuring the sample pH. Remove the probe from the sample and rinse thoroughly with distilled water before repeating the instrument calibration).
 19. Remove the probe from the sample and rinse thoroughly with distilled water.
 20. Measure and record the sample temperature.
 21. If no further measurements are being made, de-energize the instrument, and replace to the protective pH probe cover filled with fresh pH 4 buffer or deionized water.

9.0 Quality Control

Calibration data should be maintained and available for reference or inspection. Recalibrate the instrument per project requirements. Duplicate samples should be measured per project requirements.

10.0 Data Analysis

Since this meter is a direct-reading instrument, the data is recorded directly.

11.0 Documentation

Record all measurement values.

Temperature Adjusted Buffer pH Values Table

<u>Temp (°C)</u>	<u>pH 4 Buffer*</u>	<u>pH 7 Buffer*</u>	<u>pH 10 Buffer**</u>
0	4.01	7.12	
1		7.11	
2		7.11	
3		7.10	
4	4.01	7.10	
5		7.09	
6		7.08	
7		7.08	
8		7.07	
9		7.07	
10	4.00	7.06	10.15
11		7.06	10.14
12		7.05	10.13
13		7.05	10.12
14		7.04	10.11
15	4.00	7.04	10.10
16		7.04	10.09
17		7.03	10.08
18		7.03	10.07
19		7.02	10.06
20	4.00	7.02	10.05
21		7.02	10.04
22		7.01	10.03
23		7.01	10.02
24		7.00	10.01
25	4.01	7.00	10.00
26			9.99
27			9.98
28			9.97
29			9.97
30	4.01		9.96

*Cole Parmer Instruments

**VWR Scientific

1.0 Title: Standard Operating Procedure for the Field Measurement of Conductivity in Water**2.0 Location**

This SOP may be used anywhere on or off the Skinner site as long as the requirements of the SOP are met.

3.0 Purpose

This SOP will be used to measure conductivity of influent, effluent, groundwater, and surface water samples. This SOP is not applicable to solid samples.

4.0 Scope

This SOP describes the use of a portable, temperature-compensating pH/conductivity meter for field use. The instrument is calibrated using a commercially available KCL reference solution at or near 25°C, and the instrument reading is adjusted to be equal to the conductivity of the standard (at 25°C). A zero-conductivity adjustment is also made.

Because field measurements may be made at temperatures other than 25°C, and the temperature coefficient of the internal compensator may be different than the sample being measured, the temperature of the water sample shall be measured and recorded as well as the conductivity.

5.0 References

1. "YSI Conductivity Calibrator Solutions Instructions," YSI Inc., Yellow Springs, Ohio.
2. "Standard Methods for the Examination of Water and Wastewater," 16th Edition (1985), Method 205.
3. "Test Methods for Evaluating Solid Waste," Third Edition (1986), SW-846, Procedure 9050.

6.0 Sample Handling and Preservation

This procedure can be used to measure the conductivity of water samples in-situ or in a beaker which has been triple-rinsed with distilled water and at least once with sample water. If the measurement is to be made at some later time, the sample must be placed in a pre-cleaned laboratory bottle, filled to overflowing, and capped immediately to avoid dissolution of atmospheric gases. In such cases, the samples should be stored at 4°C and analyzed within 24 hours.

Conductivity standards should be stored below 30°C to minimize the likelihood of error due to evaporation or to microbial growth. The standard should be discarded if the expiration date is past, or if color, turbidity, or visible microbial growth develops.

7.0 Apparatus and Materials

1. Cole Parmer pH/Conductivity meter (DspH-3) or equivalent
2. Conductivity standards
3. Small screw driver
4. Chemwipes or equivalent
5. Beakers (100 ml or larger)
6. Laboratory supplied sample jars with labels and seals

8.0 Analytical Procedure

1. Slide back the electrode compartment to release pH and conductivity electrodes.
2. Deploy electrodes in either the 90 or 180 degree measurement position.
3. Remove the protective cover.
4. Rinse the conductivity probe thoroughly with distilled water.
5. Pat dry the probe with a chemwipe.
6. Energize the instrument by depressing the on/off switch once. (Ensure the instrument is in the conductivity mode.) For each range change desired, depress the pH/PPM microswitch once. The YSI unit utilizes 3 ranges for conductivity. The range sequence is pH-200K-20K-2K. In most cases the 2K range will be used. Only the 200K range uses the X10 enunciator.
7. Slide back the bottom compartment cover to the first stop, exposing the adjustment pots.
8. The dried probe should read 0 in air; if not, adjust the ZERO pot until the instrument reads 0. If the conductivity meter cannot zero, it may indicate dried solids on the sensor. If so, clean the probe with a mild detergent solution, thoroughly rinse with distilled water, let the probe air-dry, and repeat this step.

9. Immerse the probe in a solution of known conductivity (normally 1000+/-0.5% umhos/cm), and record the value. Also measure and record the temperature of the conductivity standard.
10. Adjust the SPAN pot until the instrument indicates the conductivity value of the known solution.
11. Remove the probe from the test solution and thoroughly rinse with distilled water and pat the probe dry.
12. Rinse the probe with the sample by placing the probe into a beaker containing an aliquot of the sample and dip in and out several times. Then, place the probe into another aliquot of the sample.
13. Read the sample conductivity. If the value exceeds the value of the calibration standard by more than a factor of 10, repeat the instrument calibration using a standard conductivity solution in the same range as the sample, then repeat Steps 8.12 through 8.13. Also measure the sample temperature to the nearest °C.
14. Record the measured conductivity reading and sample temperature.
15. Rinse the probe thoroughly with distilled water.
16. If no further measurements are being made, de-energize the instrument, remove the probe and replace the protective cover.

9.0 Quality Control

This procedure is specifically designed for survey-type field measurements, and is not capable of generating results of high precision or accuracy. If results of higher quality are desired, measurements must be made at 25 ± 0.1 °C using a calibrated conductivity meter-cell combination. Method 9050 of SW-846 is appropriate for those cases.

Calibration data should be maintained and available for reference or inspection. Recalibrate the instrument per project requirements. Duplicate samples should be measured per project requirements.

10.0 Data Analysis

Since this meter is a direct-reading instrument, the data is recorded directly.

11.0 Documentation

Record all measurement values.

1.0 Title: Standard Operating Procedure for the Measurement of Dissolved Oxygen in Water**2.0 Location**

This SOP may be used anywhere on or off the PRL as long as the requirements of the SOP are met.

3.0 Purpose

This SOP will be used to measure the dissolved oxygen content of groundwater and leachate samples.

4.0 Scope

This SOP describes the calibration and use of an electronic meter to measure the dissolved oxygen of groundwater and other aqueous samples.

5.0 References

YSI Dissolved Oxygen Meter Operators Manual.

6.0 Sample Handling and Preservation

Dissolved Oxygen measurements must be made in-situ, or as soon as possible after a portion of the sample is transferred to a beaker. Dissolved oxygen measurements should be made within 5 minute of sample collection to avoid changes in the dissolved oxygen content of the sample due to changes in the environmental factors (i.e., temperature, CO₂ content, pressure, etc.).

7.0 Apparatus and Materials

1. YSI Dissolved Oxygen Meter
2. small (100-200 ml) beakers
3. Chemwipes or equivalent

8.0 Analytical Procedure**8.1 Calibration Check**

Check calibration of dissolved oxygen meter once a day using the following procedures:

- o Turn unit on.
- o Place dissolved oxygen probe in distilled water.

-
- o Record the temperature of the water and air pressure.
 - o Calibrate the meter to the percent oxygen saturation based on the temperature and pressure measurements.
 - o Zero the meter.
 - o Place the dissolved oxygen probe in the water, bubble air through the water for 5 minute, and record the dissolved oxygen content using the procedures described in Section 8.2 of this SOP.
 - o Compare the accuracy of the dissolved oxygen measurement to the measurement last recorded. If the measurement is greater than $\pm 10\%$ repeat the measurement. If the measurement is still greater than $\pm 10\%$ replace unit with another meter.

8.2 Sample Measurement Procedures

- o Turn the meter on.
- o Record air temperature and pressure.
- o Calibrate the meter to the percent oxygen saturation based on the temperature and pressure measurements.
- o Zero the meter.
- o Submerge the probe in the liquid sample.
- o Wait for the dissolved oxygen measurements to stabilize and then record the measurement.

9.0 Quality Control

The calibration check data should be maintained and made available for reference or inspection. Check the calibration of the meter daily.

Duplicate measurements will be collected every 10 samples or fewer. If the duplicate measurement is greater than $\pm 20\%$, recheck the calibration of the meter. If the meter measurement is greater than $\pm 20\%$ of the last calibration check measurement, replace the unit and remeasure all samples (if possible) since the last duplicate measurement.

10.0 Data Analysis

Since the meter is a direct-reading instrument, the data is recorded directly.

11.0 Documentation

Record all measurement values.

1.0 PURPOSE

The purpose of this procedure is to define the requirements necessary for surface water sampling.

2.0 SCOPE

Surface water sampling is applicable to almost any site that has surface drainage on it or at any location located hydraulically downgradient from the site.

3.0 REQUIREMENTS

Many factors must be considered in developing a sampling program for surface water including study objectives; accessibility; site topography flow, mixing and other physical characteristics of the water body; point and diffuse sources of contamination; and personnel and equipment available to conduct the study. For waterborne constituents, dispersion depends on the vertical and lateral mixing within the body of water.

4.0 REFERENCES

- 4.1 Feltz, H.R., 1980. *Significance of Bottom Material Data in Evaluating Water Quality in Contaminants and Sediments*. Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., V.i, p. 271-287.
- 4.2 Kittrell, R.W., 1969. *A Practical Guide to Water Quality Studies of Streams*. U.S. Federal Water Pollution Control Administration, Washington, D.C., 135 p.
- 4.3 USEPA, 1980. *Standard Operating Procedures and Quality Assurance Manual*. Water Surveillance Branch, USEPA Surveillance and Analytical Division, Athens, GA.
- 4.4 US Geological Survey, 1977. *National Handbook of Recommended Methods for Water-Data Acquisition*. Office of Water Data Coordination, USGS, Reston, VA.

5.0 DEFINITIONS

Environmental Sample - low concentration sample typically collected offsite and not requiring DOT hazardous waste labeling as a high hazard sample.

6.0 RESPONSIBILITIES

6.1 Field Geologist

The Field Geologist has overall responsibility for the correct implementation of surface water sampling activities, including review of the Field Sampling Plan.

7.0 EQUIPMENT

1. Sampling bottles treated with preservatives if necessary.
2. Specific conductivity meter.
3. pH meter.
4. Thermometer.
5. D.O. meter.
6. Beta-gamma radiation meter.
7. Dip sampler.
8. Weighted bottle sampler.
9. Hand pump.

8.0 PROCEDURE

The following section outlines commonly used procedures for collecting surface water samples. Surface water sampling will begin at the most downstream location and proceed progressively to the upstream locations. It is anticipated that Dip Sample will be used to collect surface water samples during the RA.

8.1 Water Sampling Techniques

8.1.1 Dip Sampling

Water is often sampled by filling a container, either attached to a pole or held directly, from just beneath the surface of the water (a dip or grab sample). Constituents measured in grab samples are only indicative of conditions near the surface of the water column and in the cross section.

8.1.2 Weighted Bottle Sampling

A grab sample can also be taken using a weighted holder that allows a sample to be lowered to any desired depth, opened for filling, closed and returned to the surface. This allows discrete sampling with depth. Alternatively, an open bottle can be lowered to the bottom and raised to the surface at a uniform rate so that the bottle collects sample throughout the total depth and is just filled on reaching the surface.

A closed weighted bottle sampler consists of a stoppered glass or plastic bottle, a weight and/or holding device, and lines to open the stopper and to lower or raise the bottle. The procedure for sampling is:

1. Gently lower the sampler to the desired depth so as not to remove the stopper prematurely (watch for bubbles).
2. Pull out the stopper with a sharp jerk of the sampler line.
3. Allow the bottle to fill completely, as evidenced by the cessation of air bubbles.
4. Raise the sampler and cover the bottle.

-
5. Decontaminate the outside of the bottle. The bottle can be used as the sample container (as long as the original bottle is an approved container).

8.1.3 Hand Pumps

Hand pumps may be operated by peristaltic, bellows, diaphragm, or siphon action. Hand pumps which operate by a bellow, diaphragm, or siphon action should not be used to collect samples which will be analyzed for volatile organics because the slight vacuum applied may cause loss of these contaminants.

Tubing used for the inlet hose should be nonreactive (preferably Teflon). The tubing and liquid trap must be thoroughly decontaminated between uses (or disposed of after one use).

When sampling, the tubing is weighted and lowered to the desired depth. The sample is then obtained by operation of the pump and subsequently transferred from the trap to the sample container.

9.0 ATTACHMENTS

None.

1.0 PURPOSE

The purpose of this procedure is to define the methods to be followed when collecting soil samples from excavations or trenches.

2.0 SCOPE

Soil samples will be collected from excavations created by the removal of contaminated soil or "hot spots". This SOP should be consulted during any of the above procedures to ensure that the proper procedures are followed.

3.0 REQUIREMENTS

Sampling is being conducted to confirm that impacted soil has been excavated from the "hot spot" locations.

4.0 REFERENCES

None.

5.0 DEFINITIONS

None.

6.0 RESPONSIBILITIES

6.1 Field Team Leader

The Field Team Leader is primarily responsible for ensuring that the proper procedures are followed for collecting the soil samples. He is responsible for training the field personnel in the proper procedures for the individual tasks.

6.2 Field Geologist

The Field Geologist will be responsible for the correct implementation of soil sampling activities involving excavations, including review of the Field Sampling Plan.

7.0 EQUIPMENT

1. Pre-cleaned sample containers.
2. Tape measure.
3. Backhoe.
4. Stainless steel scoop.
5. Personnel protective equipment as needed.

6. Sample labels and cooler.

8.0 PROCEDURE

The following section describes the procedures to be used for sample collection, sample handling and additional excavation if obtained samples do not meet clean-up standards.

8.1 Sample Collection

Each sample will be collected from a discrete location with the sampling point located relative to a permanent, immovable object. The sample depth will be measured from the ground surface to the sampling point using a tape measure. The sample will be obtained from the sampling point using a backhoe bucket. The bucket will be brought to the surface and away from the sides of the excavation so the field geologist can access the bucket without entering the excavation or standing near the edge of it. The sample will then be removed from the soil in the center of the backhoe bucket using a decontaminated stainless steel scoop. The soil sample will be transferred to a pre-cleaned, laboratory-supplied sample bottle. The backhoe bucket and trowel will be decontaminated between samples in accordance with Section 6.3 of the Field Sampling Plan.

8.2 Sample Handling

Personnel will collect samples while wearing new latex or nitrile gloves. The full sample containers will be labeled and immediately placed in a secure cooler with ice. Sample custody and documentation will be conducted in accordance with Section 5.0 of the QAPjP. Samples will be shipped to the laboratory the same day they are collected.

8.3 Sample Location and Additional Excavation

Samples will be collected from the side walls and bottom of the excavations in the locations shown on Figures 2 and 3 of the Field Sampling Plan. Sample depth on the side wall will be half way between the ground surface and the bottom of the excavation. The expected depth to the bottom of the excavation is 7.5 ft.

Should the initial soil samples indicate a failure to meet clean-up standards, additional excavation will be conducted three ft in the direction of the detected contamination. This distance may be increased based on the magnitude of the contaminant concentration.

1.0 PURPOSE

The purpose of this procedure is to present methodologies for surveying and sampling aquatic organisms at hazardous waste sites to determine potential impacts on organisms at higher trophic levels.

2.0 SCOPE

The methodologies presented in this procedure are appropriate for identifying aspects of aquatic ecological communities that suggest impact due to hazardous waste contamination, identifying the potential trophic pathways and transport mechanisms for substances of public health concern, and providing useful input to evaluation of the impacts of remedial activities. The methodologies presented herein are appropriate to the specific site under investigation considering health and safety constraints.

3.0 REQUIREMENTS

The biological sampling is being conducted to help assess if surface waters are impacted by remedial activities being performed at the site.

4.0 REFERENCES

American Public Health Association. 1981. Standard Methods, 15th Edition. American Public Health Association, Washington, D.C.

Hester, E. and J.S. Dendy 1962. A Multiple-plate Sampler for Aquatic Macroinvertebrates, Trans. Amer. Fish. Soc., 91(4), pp. 420-421.

Ohio Environmental Protection Agency. 1987. Biological Criteria for the Protection of Aquatic Life. Volume 1: The Role of Biological Data in Water Quality Assessment. Ohio EPA, Columbus, Ohio.

Ohio Environmental Protection Agency. 1989. Biological Criteria for the Protection of Aquatic Life. Volume III: Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities. Ohio EPA, Columbus, Ohio.

U.S. EPA. 1973. Biological Field and Laboratory Methods for Measuring the Quality of Surface Waters and Effluents. (C.I. Weber, editor), U.S. EPA, Cincinnati, Ohio

5.0 DEFINITIONS

Benthos - organisms living on, in or attached to the bottom of a water body.

Cladocera - Water fleas. a suborder within the class comprising an important food for fish.

Community - An assemblage of plant or animal species which appear to occur together or within a given area.

Ecosystem - The biotic community and abiotic environment associated with a particular area.

Ichthyoplankton - fish eggs and fish larvae sufficiently large to be captured by a 505-micron mesh plankton net.

Macrophytes - Essentially larger aquatic plants, or all plants except microscopic plants and algae.

Periphyton - Organisms attached or clinging to submerged stems, leaves, rocks, or other surfaces projecting above the substrate.

Plankton - Organisms which float with the current and generally lack swimming capability.

Trophic Pathway - A pattern of energy and material transfer from primary producers to successive levels of consumer organisms, and ultimately, to decomposers.

6.0 RESPONSIBILITIES

6.1 Project Manager

The Project Manager is responsible for ensuring that a senior ecologist prepares, reviews, and oversees implementation of project specific plans for projects where aquatic ecological inventorying and sampling are required, and that such plans conform to this procedure.

6.2 Senior Ecologist

The Senior Ecologist is primarily responsible for ensuring the proper procedures are followed for the overall biological sampling program. He/she will work with the field biologist and field sampling team to assure that proper field methods are employed.

6.3 Field Biologist

The field biologist will be responsible for the correct implementation of biological sampling in the field and will provide guidance and training, as needed, to members of the biological field sampling team.

7.0 EQUIPMENT

1. Hester-Dendy multiple plate samplers
2. Pre-cleaned sample containers and labels
3. Coolers
4. Concrete blocks
5. Attachment cords
6. Preservative solution
7. Buckets
8. Knife
9. Backpack DC Electrofishing unit
10. Dip net

11. Camera
12. Spring-dial scale
13. Stream waders
14. PPE

8.0 PROCEDURES

8.1 Pre-Field Investigation Analysis and Field Preparation

Prior to the field effort, relevant information should be reviewed. Pre-field investigation should include the following:

- o Preliminary map depicting water bodies onsite or contained within the drainage area that requires investigation.
- o Access routes as well as emergency egress routes and safety stations
- o Existing background information on the site study area including aquatic organisms that may be found, with emphasis on species that may be indicative of existing stress or contaminant vectors, from a public health standpoint.

Sources of information to be sought and consulted include the following:

- o Aerial Photographs
- o USGS topographic maps
- o Observations and photographs obtained by previous investigators
- o State field biologists
- o Published literature on aquatic ecosystems occurring on or near the site
- o Navigational and river maps, if applicable
- o State or Federal endangered species specialists where appropriate

The field biologists will complete any field-related activities that can be performed prior to actual conduct of the field study. This includes pre-labeling of sampling containers, pre-recording certain information on data sheets, and preparing anticipated sample preservatives to proper strength.

8.2 Field Surveys

The General Field Survey will be conducted prior to the initial sampling event. This survey relies largely on observational data obtained by the field biologist utilizing a standard data sheet developed for each site. In some instances, simple techniques such as dip netting, which utilizes disposable nets, can be employed to provide qualitative information on species presence or for obtaining specimens for tissue analysis.

A Detailed Field Survey will be performed where more specific information is needed or data from surface water sampling need to be supplemented. The data typically obtained from this survey includes:

- o Water Quality
 - pH
 - Dissolved oxygen
 - Temperature
 - Conductivity or salinity
 - Transparency
- o Flow
- o Average width and depth
- o Circulation
- o Bottom composition - sieved samples
- o Invertebrates - grab samples drift nets
- o Canopy percentage cover
- o Fish Electrofishing

8.3 Data Recording

Standard aquatic ecology field data sheets will be used for the general field survey. These sheets should be preprinted on weather resistant paper to ensure that data is preserved under adverse field conditions and should include at least the following items:

- o Rust Project Number, site name and location
- o Date and time
- o Recorder (Investigator)
- o Station Location
- o Sample description and/or sample number as appropriate
- o Weather conditions
- o Record of any photographs taken

8.4 Specific Methods and Materials

8.4.1 Benthic Macroinvertebrates

Benthic macroinvertebrates live on or in the water substrate. They can constitute an important component of the food chains of fish species and consequently may link sediment-contained pollutants with the human food chain. Benthic macroinvertebrates are often used as indicator species of stress on aquatic composition and density is largely determined by substrate types and local environmental conditions.

Hester-Dendy multiple plate samplers will be used for the collection of macroinvertebrates. A total of five samplers will be placed at each sampling location. The samplers will be tied to a concrete

block. Whenever possible, samplers should be placed in runs, rather than pools or riffles. The samplers will be left for a period of six weeks. At the end of the six week sample period, the samplers are cut from the concrete blocks and placed in plastic sample containers while still submerged. Care should be taken to avoid disturbance of the organisms on the plates. Preservative is then added to the sample containers to achieve an approximate 10% preservative solution. Samples are then carefully packed for shipment to the laboratory.

8.4.1 Fish

Fish comprise an obvious and an important part of the food chain for humans as well as for wildlife species such as waterfowl. The methods for sampling fish at the Skinner site will be electroshocking.

Electroshocking - Electroshocking is used in freshwater sampling and can provide specimens for obtaining data on species composition, relative abundance, size distribution or tissue chemistry.

Electroshocking involves producing an electric field between two electrodes immersed and placed in a body of water. Any fish entering the field are stunned which causes them to be captured with dip nets. After sampling, the fish should be measured, weighed, and identified or preserved in labeled bottles.

There are essentially two types of electrofishing equipment, those using Alternating Current, and those using Direct Current. With DC current, fish are attracted to the anode, facilitating recovery by the sampler. The field produced using AC current has a larger effective range but fish may be lost in turbid or swift moving waters since they are not attracted to an electrode. In addition, using AC currents, there is a greater danger of killing the fish.

When electrofishing on foot, the sampler wades upstream, taking care to sample all habitats. A second person follows to help net, carry the catch, or carry the electrode.

The electric current generated by shocking equipment (particularly AC Devices) can cause serious injury to the user if safety precautions are not rigorously followed. Before field use, the investigator should become familiar with the equipment and its proper operation. Only devices with automatic cut-off switches should be used. Electroshocking crews should comprise three people, two samplers and an observer. Crew members entering the water must wear rubber boots and gloves. At least one member of the crew should be trained in First Aid and CPR.

Fish collected for the fish community assessment will be weighed and assessed for external anomalies. Fish will be weighed as separate individuals or in aggregate as a species depending on the catch success and the individual characteristics of the sampled population. A spring-dial scale will be used to weigh the fish. In general, larger, adult fish will be weighed separately. Smaller fish, juveniles, or large numbers of a single species will be weighed in aggregate. All fish that are weighed will then be examined for gross external anomalies, visible to the naked eye. These anomalies include: deformities, eroded fins, lesions and ulcers, tumors, anchor worm, black spot,

leeches, fungus, ich, and popeye. The results of the weighing and anomaly evaluation will be recorded on field data sheets.

Fish that are collected for bioassay will be bagged in plastic bags, labeled, and immediately placed in coolers with ice.

9.0 ATTACHMENTS

Field data sheets

Fish Sample Collection

Date: _____ Site: _____ Project No.: _____

Station Location: _____

Collection Method: _____

Sampling Duration (min): _____ Sampling Distance (m): _____

Weather: _____ Flow (flood, bankful, moderate, low): _____

Observers: _____

[illegible]

(*) Discoloration, deformities, eroded fins, excessive mucus, excessive parasites, fungus, poor condition, reddening, tumors, and ulcers.

Invertebrate Sample Collection

Date: _____ Site: _____ Project No.: _____

Station Location/Description: _____

Collection Method: _____

Weather:

Observers:

[illegible]

Comments:

SKINNER LANDFILL
REMEDIAL DESIGN
FINAL DESIGN (100%) PHASE I REPORT

VOLUME IV OF IV, PART 1

**THE FOLLOWING MAPS MAY BE VIEWED AT THE U.S. EPA RECORD CENTER,
77 WEST JACKSON BLVD., 7TH FLOOR, CHICAGO, ILLINOIS**

- 1) EXISTING MONITOR WELL LOCATIONS AND WELLS TO BE ABANDONED**
- 2) NEW MONITOR WELL AND PIEZOMETER LOCATIONS**
- 3) RA IMPLEMENTATION SURFACE WATER MONITOR LOCATIONS**